THE ECONOMICS OF PUBLIC UTILITIES

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A Reference Book For Executives, Investors, Engineers, and Students

BY
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FOREWORD

In his experience of more than twenty-five years in the business of designing, constructing, and managing public utility properties the author has often felt the need of a comprehensive book dealing with the broader business and economic problems of the industry. He has had to answer many inquiries from purchasers of or dealers in securities, commercial organizations, students, engineers, and others seeking fundamental data and principles, sometimes by referring the inquirers to a discouragingly formidable list of books and documents, many of them not readily accessible and each dealing with only a limited phase of the subject.

There is a vast number of treatises, handbooks, reports, and textbooks dealing directly with the engineering and commercial problems of the industry, and many other similar works which are indirectly helpful. The technical press and publications of engineering and professional societies have for many years contained much material which has a more direct appeal to executives and others seeking information of a general character. There is available also, beginning with 1915, a careful compilation of all important decisions of regulatory commissions and courts dealing with economic as well as engineering and commercial problems.

A thorough study of all this literature by anyone whose primary activities are in other fields is impossible. Many such people, however, are at times called upon to make important decisions fundamentally affecting public utilities and the public which they serve. City and state officials must pass upon the terms and conditions of franchises and tax and other legislation. Attorneys are sometimes drawn into public utility cases with scant opportunity to grasp their basic distinguishing features. Engineers are retained to appraise property and present highly technical and specialized testimony in rate cases. Investors, for themselves or those whom they serve as trustees, must judge with increasing frequency the merits of public utility offerings from available financial and statistical statements.

These and others interested in special problems need a background of general information in order satisfactorily to handle their work. Furthermore, every American citizen who comes in contact with public utility service should have at least a general knowledge of its fundamentals to permit intelligent action concerning some issue upon which he may vote.

Within the last few years the national associations of the utilities have joined in an effort to distribute information regarding the problems and aims of the industry to newspapers, libraries, colleges, and elsewhere—all looking to the result under consideration. Such efforts are necessarily fragmentary, but stable structures may be made of well-cemented fragments, and no more effective way has yet been devised directly to reach the widely scattered citizenship of our country.

The author has hesitated to undertake so formidable a task as to assemble what appear to be the essential facts and the most mature views upon the underlying financial and economic phases of one of the world's most important industries. The task would not have been undertaken were it not for the extreme divergence of widespread opinions regarding these matters, some of which clear analysis shows to be without logical foundation and detrimental to the progress and usefulness of the industry. It is unfortunate that, particularly in earlier years, political issues were raised over public utilities, and many of the unsound views here referred to were then developed. With the gradual elimination of the utilities from the political field and their recognition as stable business enterprises, the establishment of wholly sound business and economic principles in all their relations becomes increasingly important.

The impulse to attempt the closing of an apparent gap in existing utility literature, which had long and persistently haunted the author, developed to irresistible proportions nearly two years ago. The collection of material for this book has since been carried on amid the distractions of a business office and recurrent calls for service in other parts of the country. The thought of embodying in the text some earlier published papers on the subjects discussed was promptly abandoned as detracting from the desired continuity. The text is, therefore, entirely new, although it embodies the substance of material contained in previous papers and lectures. Current promssional duties have necessarily retarded the preparation of featerial,

but they have also added to an accumulating store of data and permitted reference to recent significant developments in a rapidly expanding industry.

Because of the very wide range of public utility activities and the necessary limitations of a treatment of this character, the narrowest practicable meaning of the term "public utility" has been selected. The service rendered by the railroads and wire and wireless communication companies is of vital importance, but each of these groups has its own peculiar problems differing from those of utilities which render more localized service. Water-supply systems are owned and operated largely by the cities which they serve. There remain three important groups of properties: electric light and power, electric railway, and gas, which have, to a large extent, similar problems and service conditions. These groups have been selected as the basis of the present analysis and discussion, although it will be found that many conclusions and observations regarding them apply, in part at least, to the previously mentioned groups and to other minor classes of utilities.

Although some reference has been necessary to engineering and commercial phases of the business, their detailed discussion and technica terms have been avoided as far as possible so that attention will not be diverted from the business and economic problems which are the impelling motive of this book. There is no intent to suggest that such problems of public utilities are essentially different from those which are encountered in other business. There are, in fact, no fundamental differences, and none can be created and successfully maintained. One of the fallacies of our democratic form of government is that economic laws, which are the product of centuries of human experience, can successfully be replaced by legislative acts which reflect only the wisdom or the folly of the present day. Many such acts and their administration affecting public utilities have been undertaken in recent years. This book will justify itself if it serves no other purpose than to demonstrate that all public utility activities must not only be permitted but required to conform to basic economic laws, and to indicate how these laws are to be interpreted and applied.

For those readers who wish to pursue further studies, references are given at the end of each chapter to other publications in which the subject matter has been more extensively consid-

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CHAPTER I

ORIGIN AND DEVELOPMENT OF PUBLIC UTILITIES

Scientists tell us that life in some form has existed on this world of ours for more than 100,000,000 years, but that traces of the existence of human beings extend back only 50,000 years or less. The evidence which the earth's surface has revealed to substantiate these estimates is meager and uncertain. Further research may indicate that the estimates are somewhat high or many times too low. It is, however, claimed that any changes in these estimates which may be found necessary will affect the periods of total life and human life proportionately, and that it is reasonably accurate to say that the history of man covers only one-twentieth of one per cent of the total period of life upon the earth.[1]

Our authentic knowledge of man's struggle for existence and supremacy over the forces of nature is, in turn, comparatively brief. For many thousands of years primitive man fought his battles with nature and his fellows alone, with no weapons except what his bare hands could shape, no organized means of dealing or even communicating with others of his kind, and no control over animals or natural forces. Following these prehistoric days came a gradual development of mental capacity, use of natural resources, and cooperation for mutual defence and material advantages, and, finally, came the fuller recognition and utilization of natural forces which have brought about a new and previously unimagined civilization.

UTILIZATION OF NATURAL RESOURCES

It is a curious coincidence that the period within which mankind has comprehended these new forces, and so adapted them to his service as to revolutionize his methods of living, bears very

[1] KEITH, ARTHUR, "Antiquity of Man."

closely the same relation to his total life upon the earth as does his total life to the entire period of life in any form. One-twentieth of one per cent of man's years upon the earth is probably measured within a generation, or at most a century. The past hundred years have witnessed the practical development although not the discovery of the steam engine and the countless applications of mechanical power which it made possible, also the utilization of electric energy for communication, and innumerable domestic, commercial, and industrial purposes. The large-scale applications of electric energy have occurred during the past thirty or forty years. The first electric street cars appeared in the United States in 1888, seven years later than their first use in Europe. The first commercial electric light plant in the United States was built in 1882, sixteen years after the first practical use of an electric lamp, and seventy-three years after the experimental discovery of its possibilities. The telephone was invented in 1876 and immediately put to general use, thirty years after wires were first used commercially for telegraph messages.

The modern developments in electrical science have been very intimately connected with those of the group of industries known as public utilities, which depend so largely upon this agency. Public utilities of certain classes existed long before practical applications of electricity were made. Gas was first commercially sold in this country in 1817, about fifteen years later than the first sales in Europe. Horse cars were used in cities of this country and Europe about one hundred years ago. Cable cars were introduced in this country (San Francisco) in 1873. The supplying of water is a very old industry, but the early systems of wells and canals, and the street vendors of the ancient cities with their water skins and jars, had little in common with the modern systems with pumping stations and mains which had their origin over three hundred years ago, and their initial appearance in this country in 1652.

PUBLIC UTILITY DEVELOPMENT

In spite of these early activities in the public utility field, it is still true that the major developments have occurred within the last third of a century. Within this period more than 95 per cent of the entire investment in public utility facilities has been made. In spite of the fact that this development has taken place

during an exceedingly small fraction of 1 per cent of the period of hu life upon the earth, this group of industries already ranks among the world's foremost organized activities.

The total capital invested in electric railways, light and power systems, gas companies, and wire communications in the United States is about $17,000,000,000. Steam railroads alone have a somewhat higher aggregate capitalization amounting to about $20,000,000,000. The nearest approach to these totals in any other organized productive industry or group of allied industries is found in the iron and steel business, in which the capital value in foundries and rolling mills amounts to $3,500,000,000. The capital invested in textile mills is about $3,000,000,000, while that devoted to the automotive industry is upwards of $2,000,000,000. There are only a few other industries, including shipbuilding, slaughtering and meat packing, paper and pulp, printing, and petroleum refining, which have capital requirements exceeding $1,000,000,000. Since the compiling of the 1919 census data on manufactures, from which the above figures are taken, there have been marked developments in certain industries, particularly the petroleum and automotive groups, but they have not affected the relative prominence of the public utility group.

The property devoted to mining and agricultural pursuits has a much greater total value than those listed above but a large part of it consists of natural resources, and the widely scattered and uncoordinated character of these activities distinguishes them sharply from those under consideration. The value of property devoted to agriculture is about $80,000,000,000, of which not less than $56,000,000,000 is the value of bare land, and probably more than one-half of the balance represents the homes and personal property on 6,500,000 farms, leaving a comparatively small proportion of the total agricultural investment devoted to production facilities. The total capitalization of mining property of all kinds in the United States is about $7,000,000,000, a large part of which is also in natural resources.[1]

SCOPE OF PRESENT STUDIES

The above approximate data have been assembled to give a general picture of the important part which public utilities play

[1] See *U.S. Census Reports* for these and preceding data.

in the business and industrial world and their phenomenal growth in a brief span of years. The very fact of this exceedingly rapid growth is responsible for many unique problems of administration, supervision, engineering, and public relations, the equitable solution of which in important instances has not yet been reached. Before passing to the more detailed discussion of certain of these problems with which this book is concerned, it will be desirable to have a more specific outline of the development and status of the several types of utilities which are to be studied. These include electric railways, electric light and power systems, and gas companies. For the sake of brevity these three groups will be commonly referred to herein as railway, electric, and gas utilities. To the extent that other privately owned utilities render comparable local service, their problems are similar and do not need special treatment. The problems of the steam railroads are in a class by themselves and are too complex to be considered within the limits of this book. The interstate character of a large part of the telephone and telegraph business also involves conditions which cannot be fully considered here. As indicated by the data already given, it will further be necessary to confine attention largely to utilities in the United States.

Railways.—The early records of electric railways are by no means complete. Although they began to replace horse cars and cable cars in 1888, the first installation being in Richmond, Va., the first complete census of the industry was not taken until 1902. It is learned from a limited special survey made in 1890 that there were then only 1,200 miles of electrified track and less than 3,000 electric cars. Many of the remaining data of that year are combined with those relating to horse or cable operations. Table I contains some of the pertinent data showing the development of the railway industry, taken from the United States census reports.

The significant features of the table are the comparatively slight increases in trackage, rolling stock, and corresponding capitalization during the latest ten-year period. On the other hand, passengers have shown a substantial increase, and, of particular significance, the revenue rides per capita have continued to show material gains in spite of the remarkable increase in automobile traffic. This phase of the situation will be given further attention in a later chapter.

Table I.—United States Census Data on Electric Railways

	Units	1902	1907	1912	1917	1922
Track operated	Thousands of miles	22.5	34.4	41.1	44.8	43.9
Total number of cars	Thousands	67	84	94	103	99
Net capitalization	Millions of dollars	2,118	3,400	4,243	4,890	4,662
Net capitalization per track-mile owned.	Thousands of dollars	96.3	100	105	111	108
Revenue car-miles	Billions	1.14	1.62	1.92	2.14	2.12
Revenue passengers	Billions	4.77	7.44	9.55	11.3	12.7
Operating revenue	Millions of dollars	248	418	536	650	925
Gross income	Millions of dollars	95	159	218	232	256
Revenue rides per capita (U. S.)	One	60	85	100	111	116
Revenue rides per track-mile	Thousands	212	217	233	261	299
Operating revenue per track-mile.	Thousands of dollars	10.8	11.7	12.9	14.5	21.1
Passenger revenue per revenue passenger	Cents	4.94	5.15	5.27	5.34	6.74

Unofficial figures, gleaned from various sources, indicate that in the two years since 1922 there have been net increases including over 400 miles of track, about 2,500 cars, and more than $300,000,000 in investment. The total number of passengers carried in 1924 (including transfers) was about 16,000,000,000 as compared with 15,300,000,000 in 1922. A statistician of leisure has estimated that the 1924 passengers, if mobilized in columns of four, would form a procession long enough to encircle the earth 242 times and to require 173 years to march by a given point at the rate of 4 miles per hour.

The above figures, and the census data for 1922, include bus service operated by the railways, but not independent local and interurban bus lines. The latter are estimated to include 25,000 buses, carrying 1,500,000,000 passengers per annum—a greater volume of traffic than is handled by steam railroads, and about one-tenth that of electric railways.

Electric Utilities.—The early records of electric light and power utilities are also meager. The first complete census, as in the

case of electric railways, was made in 1902. The only previous collection of this character (referred to in the 1902 census) applied wholly to operations in 1890 in the state of New York and certain scattered large cities, from which it is not possible to draw any helpful conclusions as to the status of the industry at that time or its progress prior to 1902. It is learned, however, from the general history of the industry that following the installation of the first central station on Pearl Street, New York, in 1882, many small electric light plants were promptly built throughout the country. It was many years before modern types of equipment and underground distribution systems were utilized. Table II, compiled from United States census reports, shows some of the significant facts regarding the industry and its developments:

TABLE II.—UNITED STATES CENSUS DATA ON ELECTRIC LIGHT AND POWER PROPERTIES

	Unit	1902	1907	1912	1917	1922
Capacity of stations	Millions of kilowatts	1.21	2.71	5.17	8.99	14.31
Value of plant and equipment.	Millions of dollars	505	1,097	2,176	3,060	4,465
Power output[1]	Billions of kilowatt-hours	2.5	5.9	14.2	31.0	50.3
Power output per capita (U.S.)	Kilowatt-hours	32	67	150	303	460
Operating revenues	Millions of dollars	86	176	302	527	1,072
Operating revenue per kilowatt of capacity	Dollars	71	65	58	59	75
Operating revenue per kilowatt-hour output	Cents	3.44	2.98	2.13	1.70	2.13
Number of customers	Thousands	(3)	1,947	3,838	7,179	12,710

[1] Figures for 1902 and 1907 include power generated only; others include power purchased also. Intercompany power not deducted.

[2] Not reported.

The figures in the census table show the remarkably consistent advance in the industry throughout its history, particularly in the last five-year period. Unofficial figures which have been compiled for the year 1924 indicate an increase in value of property to $6,600,000,000; installed capacity to 22,000,000 kilowatts; power output to 54,000,000,000 kilowatt-hours; operating reve-

nues to $1,350,000 000; and number of customers to nearly 16,400,000, of which 13,300,000 are residence, 2,500,000 commercial lighting and power, and 600,000 industrial power customers. The total population now served is estimated at 65,600,000. No community of 5,000 or more population in the United States is now without electric service.

Gas Plants.—The data regarding companies distributing manufactured gas are less complete than those available for railway and electric plants. Separate censuses have not so far been made, and the gas statistics in the Censuses of Manufactures are meager. From such censuses, the records of the American Gas Association, and other sources, the data shown in Table III have been assembled. The accuracy of these figures is not vouched for, but it is believed that they give a reasonably consistent picture of the progress of the industry. It will be noted that the number of distinct companies furnishing gas has diminished during the past ten years. This is also true of electric companies, the corresponding figures for which have not been presented. In both cases, the reduction is accounted for by the consolidations of companies, which have occurred with increasing frequency. It is obvious from other data that the reduction in number of companies has not been accompanied by any curtailment in activity but rather by more intensive development and expansion. The population now served with manufactured gas is estimated at 52,000,000.

TABLE III.—DATA ON MANUFACTURED GAS PROPERTIES

	Units	1889	1899	1904	1909	1914	1919	1924 (estimated)
Number of companies....	One	742	877	1,019	1,296	1,284	1,022	1,000
Capitalization...........	Millions of dollars	259	567	725	916	1,252	1,466	2,000
Operating revenues.......	Millions of dollars	57	76	125	167	220	329	450
Gas sold................	Billions of cubic feet	33	62	114	143	199	307	405
Miles of main...........	Thousands..	...	...	.....	45.1	58.7	69.7	77
Number of customers.....	Thousands	...	...	.....	.....	.....	8,253	10,240
Sales per capita (U.S.)....	Feet	...	...	1,383	1,583	2,040	2,939	3,600

NOTE: Natural gas, not included herein, is used to a greater extent than manufactured gas. The 1922 sales were 763,000,000,000 cubic feet.

SIGNIFICANT FEATURES IN UTILITY PROGRESS

The foregoing tables show primarily, for the industries involved, a rate of growth unprecedented in history. They fail

to reveal certain other significant features connected with this growth, among them being a marked reduction in price of the service rendered or an equivalent increase in quantity of service for a given price. The original price for gas in Boston, which is said to have the longest record of continuous service in the United States, was $5 per thousand feet. It was still higher in some other large pioneer plants. Before the World War the price in a number of large cities was 80 cents, and the common rate throughout the country was $1 for a product not radically different from that made in the early days. The pioneer rate per kilowatt-hour for electric light service was 20 cents or thereabouts. The present maximum rates average about half as much, and the efficiency of lighting units has been so increased that the amount of illumination now sold for a given sum is more than ten times what it was originally.

The electric railways have not reduced the average charge for their service, but through increases in length of ride, speed, safety, and convenience of service, they have vastly increased the value of what they offer for a comparatively stable, although somewhat higher, price. Public utilities today have the distinction of selling their products at a lower relative rate than any other comparable industry. Such a record has been possible only through continuous engineering progress, patient research, and persistent commercial activity. In the early days it required from 5 to 10 pounds of coal to produce a unit of electric energy. Present designs of large power stations anticipate a consumption of about 1 pound per unit.

Consolidations.—One other significant development is worthy of notice. During the past twenty years, in which the population of the United States has increased about 40 per cent, electric railway service 170 per cent, gas service over 200 per cent, telephone service 1,000 per cent, and electric light and power service 2,000 per cent, the number of separate utility companies has shown comparatively little change. The total number of electric light and power companies is now less than double the number existing in 1902. As a matter of fact, many of the utilities reported by the Census Bureau are no longer independent operating companies. More recent surveys indicate that not more than 5,700 distinct companies were actually operating in 1924. It is obvious that each of these companies has grown, and grown more rapidly than the community served. The Commonwealth

Edison Company of Chicago, the largest urban system, produces alone more electric power than the entire central station industry did twenty years ago. This company has not only intensified its sales of service but has also attached to itself many formerly independent companies serving some part of the large area now reached by one combined system.

This illustration is typical of a movement throughout the industry, as in other fields, but with peculiar advantages through the substitution of a few large, efficient power stations with high-voltage transmission lines in place of many small, independent stations. In addition to combinations of neighboring companies into one large system, there has been a progressive tendency to bring together groups of otherwise unrelated and perhaps widely separated properties under the control of a holding company, this control being effected through purchase of outstanding stock. There are distinct advantages accruing to the operating companies through this arrangement. The smaller properties cannot afford to employ regularly and exclusively a high degree of administrative, financial, and technical skill.

A large holding company can command and retain a capable trained staff available at all times and at comparatively small cost to its individual subsidiaries. It may negotiate bulk purchases of construction material and supplies at prices lower than smaller, independent purchasers could obtain. In addition to these and other similar advantages, the holding company, in offering its collateral securities to investors, has the advantage of a stability in earnings through the diversified character, location, and prosperity of its various subsidiaries which no single property, unless very large, can insure.

Centralized Control.—Opposition has often been voiced to the vast aggregations of capital represented in holding companies and industrial consolidations with their possibilities of pyramiding of capital and manipulations of prices and production costs. Such opposition may have force in industrial situations, but public utilities under regulation are restricted to reasonable returns to their owners, whether they be individuals or holding companies, and the capitalization of neither operating nor controlling company is a factor in the determination of such returns.

Such objections, however inapplicable they may be to public utilities, are avoided in another form of supervision known as centralized management, under which a trained organization is

employed to manage a group of wholly independent properties. With a group sufficiently large, as in the case of a holding company, there is the advantage of a degree of skill which the independent companies could not secure exclusively except at a much higher and usually prohibitive cost. This form of administration has an advantage in that it is not effected through ownership and can be terminated by the employing utility. It does not offer all the advantages of earning stability through diversity found in holding company operations, but does insure sound financial and business methods which make for stability. These two forms of centralized control or supervision have been found so successful in the public utility field that they together direct the operations of more than 75 per cent of all privately owned utility property in the United States.

PERIODS IN UTILITY HISTORY

Before passing to other phases of the public utility business, it may be of interest to indicate a division of the history of public utilities utilizing electric energy, briefly outlined in this chapter, into four fairly distinct periods, in which pioneering, engineering, commercial, and public relations problems have successively predominated.

Pioneering.—In the pioneering or development period, which included the history of these utilities up to about thirty years ago, primary attention was given to establishing the industry as widely as possible throughout the country, with such crude apparatus as was then available. The men who organized the new companies and put them into operation were not trained for such business because no opportunities for such training had existed. Many of the organizers of these early companies had no permanent interest in individual properties but passed from one to another as fast as stable operations had been accomplished.

Engineering.—The second or engineering period came through a realization of the crudeness, inefficiency, and inadequacy of existing facilities. Intensive studies as to the needs of the industry resulted in the development by the end of this period, about fifteen years ago, of substantially the present types of machinery and appliances. In subsequent years there have been radical increases in size of units and further improvements in efficiency but no radical changes in kind.

Commercial.—The third or commercial period is significant for its appreciation of the fact that the industry was not making as extended use of its facilities as their value justified. The business was still devoted largely to lighting and small power which left its investment idle during a large part of the time. The commercial period embraced active efforts in developing large power business, with the result that most of the small, competing plants and many large industrial power installations have been abandoned and central station service substituted.

Public Relations.—The final or public relations period, which began about ten years ago, is marked by a realization of the interdependence of public utility properties and their customers, the necessity of public utility growth to community development, and an appreciation by the utilities that their prior reticence regarding their financial affairs had led to erroneous impressions of their profitableness. Major public relations activities have largely developed during the past five years, which have witnessed the establishment of information bureaus supported by the public utilities and functioning in about three-fourths of the states. The importance of satisfactory public relations is so great that further attention will be given to it in a subsequent chapter.

Cooperation.—Some observers of public utility history may claim that electric utilities are now entering upon a fifth period characterized by greater cooperation among the utilities, this cooperation being evidenced by so-called superpower developments and interconnections. Recent surveys of the Atlantic seaboard states have disclosed a large proportion of electric power generated in comparatively small and inefficient plants, whereas other more modern plants, not widely separated, were not fully loaded.[1] Sufficient progress has been made in interconnection between previously independent systems, particularly those having hydroelectric plants, to show vast possibilities in saving in total investment through reduced reserve capacity, diversity in use of service, and in available hydroelectric power, together with large differences in steam-power efficiency, all clearly justifying large expenditures for transmission lines connecting previously independent properties.

[1] Murray, W. S., and Others, "A Superpower System for the Region between Boston and Washington," U.S. Geol. Survey, *Professional Paper 123.*

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CHAPTER II

DISTINGUISHING CHARACTERISTICS OF PUBLIC UTILITIES

Before proceeding to a discussion of specific phases of public utility activities it will be desirable to supplement the picture already presented of the origin and development of these industries by a discussion of certain characteristics which distinguish public utilities from other industries. To the extent that these characteristics require special treatment or have led to regulatory provisions to which other industries are not subject, they must enter into the solution of many of the special problems with which public utilities have to deal.

PUBLIC SERVICE OVER PUBLIC WAYS

It has been said that public utility service is "affected with a public interest." This is a rather indefinite way of saying that such service is essential to the public welfare. For this reason, public utilities in certain cases are given the right to condemn private property for right-of-way and other purposes. This right of condemnation, shared and first exercised by railroads, is not found in strictly private business, nor does private business in general have the right to erect and maintain permanent structures on, above, or below public highways. While such permanent obstruction is peculiar to public utilities, it does not follow that their use of public highways causes any more practical obstruction per unit of service than does much of the private business which necessarily uses the highways.

Street railways, for example, carry passengers on the streets with far less obstruction per passenger than is occasioned by taxis and private automobiles. Estimates have frequently been made, and actual experience in a number of cities has shown that passenger transportation in our larger cities cannot possibly be handled entirely by vehicles of the ordinary type because of the impossibility of finding room for them on the streets. Public utilities are not permitted to occupy public streets with their fixed property

without special permission, usually in the form of a franchise agreement, the characteristics of which will be considered in a later chapter.

RESTRICTED COMPETITION

Public utilities are more and more coming to be regarded as natural monopolies. By this is meant that each public utility should have a monopoly of its particular class of service in its chosen field. Monopolies in other business are unlawful, at least where their products enter into interstate commerce. Except in a very restricted sense no public utility service is wholly monopolistic, in spite of many assertions to the contrary. Railways compete with steam railroads, private automobiles, taxis, jitneys, bicycles, and sidewalks. Electric companies are in competition with private power plants and gas companies. Gas companies, in turn, must meet competition from coal, wood, oil, and electric service. Telegraph and telephone companies compete with each other. The only public utility field in which competitive substitute service is not available is that of water supply, which is usually handled by the municipalities.

Advantages of Monopoly.—While it is thus generally true that public utilities are subject to competition in at least a part of their service, freedom from competition from other public service of the same kind is of substantial advantage both to the utilities and their customers, although this is not considered true of general business. The reason for this lies primarily in the high capital costs and fixed charges to which public utilities are subject, the fixed charges constituting at least one-third of the total cost of service. Competition in kind between public utilities means duplication of facilities such as power stations, track, overhead lines, and underground structures. Ordinarily, one set of tracks or poles or underground structures can handle the entire necessary service in a community. Therefore, if competing systems exist and rates are adjusted to yield a full return upon the aggregate investment in these systems, as is necessary in the long run if competition continues, these rates will be substantially higher than for service from a single system. Furthermore, two competing sources of power supply, shops, and other necessary facilities involve not only substantially greater investment, but also higher operating and administrative costs, than would one system of suitable capacity for the entire service.

The advantages of monopoly in public service are so well recognized that it is the practice in many states to prohibit competition where an existing utility is rendering adequate service at reasonable rates. Where both service and rates are under the control of public authorities there remains no good reason for permitting competition. Even where legislative restrictions on competition do not exist, the disastrous results of superfluous investments and the rate wars which inevitably occur are now so well known as to discourage ventures of this kind which were popular in the early days of public utilities.

HIGH CAPITALIZATION

Reference has been made above to the high capitalization and fixed charges of public utilities as compared with other industries. Public utilities are often subjected to criticism or condemnation because of alleged excessive capitalization, including "watered" stock. A typical public utility serving a large community has a capitalization not less than four times its annual revenues. In very large cities where extensive transmission and substation systems, paving, and other costs incident to congestion are encountered, the ratio may be materially higher than that stated. The same is true of hydroelectric and other special developments.

Industrial Capital.—The conventional manufacturing enterprise, on the other hand, has a capital less than its annual revenues. The latest United States census shows for all manufacturing enterprises an average ratio of capitalization to value of product of 0.716. Superficially, therefore, it would seem that the criticism of public utility capitalization might be justified. A careful analysis, however, of the factors which determine capitalization shows that such criticism is not in fact appropriate. A study of particular manufacturing industries shows that they depart very widely from the general average. In certain industries such as starch mills, clothing factories, meat-packing plants, and sugar refineries, the ratio of capitalization to value of product is in the vicinity of 0.3, the capital in all these cases being "turned over" more than three times a year. In other cases it is very much higher than the average. For example, the manufacture of sewing machines and watches requires a capital more than 1.5 times the value of the annual product. Such wide variations cannot exist without a sound logical basis, and it is

pertinent to study the possible factors affecting capitalization to see if certain fundamental rules may not be deduced which will explain the differences among manufacturing establishments and between them and public utilities.

Ratios of Capital to Value Created.—Obviously, high capitalization must result from a large investment in machinery and other manufacturing facilities. Such investment is made for the purpose of creating value or adding value to the raw material of the industry. A study of manufacturing statistics shows a wide variation in the proportion of raw material entering into the products of these industries, and a complementary wide range in the value added in manufacture. If capitalization is compared with value created in manufacture rather than total value of product, the apparent inconsistencies between industries tend to disappear and a general rule may be stated, namely, that *other things being equal, capitalization is proportional to value created.*

Table IV, taken from the 1919 Census of Manufactures, shows for certain representative groups of industries the total capitalization, annual value of the product, value created in the manufacturing process, and the ratios of value created to total value and of capital to total value. The value of the product is assumed to be its selling price, including interest, profits, and other overhead, such as the sales organization, normally approximating the annual earnings of the business. The difference between the total value of products and the value created is the cost of raw materials which includes not only the bare cost of the materials that are fabricated and sold but also maintenance and operating supplies for the fabricating plants.

There have been added to this table corresponding data relating to the various classes of public utilities under consideration and also a large group of widely scattered companies of varying sizes carrying on a diversified railway, electric, gas, and water-supply business, and, therefore, presenting a composite picture of the utility industry. Some adjustments and approximations have been necessary in the case of the public utility data to make them conform to the census figures of manufactures, but it is believed that they fairly represent the characteristics of the industry which, in some cases, is engaged in producing and selling service rather than a tangible product. The composite utility group includes only normal utility properties engaged wholly or largely in urban or retail service.

TABLE IV.—COMPARATIVE DATA ON CAPITALIZATION AND PRODUCTION, MANUFACTURING AND PUBLIC UTILITY INDUSTRIES

Industry	Capital	Annual product		Ratios	
		Total value	Value created	Value created to total value	Capital to value
	(Millions of Dollars)				
Automobiles	1,310	2,388	809	0.34	0.55
Boots and shoes	613	1,155	440	0.38	0.53
Bricks, tile, etc	356	208	141	0.68	1.71
Cement	271	175	96	0.55	1.55
Confectionery and ice cream	317	637	268	0.41	0.50
Cutlery	69	67	47	0.70	1.03
Explosives	133	92	47	0.51	1.45
Fertilizers	312	281	96	0.34	1.11
Flour and feed	802	2,052	253	0.12	0.39
Furniture	424	571	310	0.54	0.74
Glass	216	262	171	0.65	0.82
Glucose and starch	58	186	56	0.30	0.31
Ice (artificial)	271	137	94	0.69	1.98
Iron and steel rolling mills	2,657	2,829	1,148	0.41	0.94
Leather	671	929	282	0.30	0.73
Machine tools	231	212	153	0.72	1.09
Matches	29	18	12	0.66	1.61
Pianos	116	107	53	0.50	1.08
Pumps, steam	55	54	30	0.56	1.02
Sewing machines	71	44	27	0.61	1.61
Slaughtering and meat-packing	1,176	4,246	463	0.11	0.28
Smelting and refining copper	309	651	67	0.10	0.47
Typewriters	48	53	37	0.70	0.91
Watches	49	32	26	0.81	1.53
Total manufacturing	44,579	62,418	25,042	0.402	0.716
Electric light and power (1922) (commercial plants)	4,229	987	717	0.73	4.29
Electric railways (1922)	4,662	925	795	0.86	5.04
Manufactured gas (1919)	1,466	329	237[1]	0.77[1]	4.45
Composite group of utilities (1923)	196	40	35	0.88	4.86

[1] Adjusted to include residuals.

A study of this table shows a pronounced tendency to high capitalization when the value created is proportionately high, and low capitalization when such value is low, but without complete

the boot and shoe industry, the combination would give a ratio of capital to value of boots and shoes of 1.10.

If, by a further similar process of reasoning, the value of farm lands and property devoted to the raising of cattle for the packing industry were in turn added, the entire series of capital requirements finally devoted to boot and shoe manufacturing would be found at about $3,000,000,000, or over 2.5 times the value of boots and shoes. This final ratio, while approaching the public utility ratio, is still lower than the utility average although not lower than some individual utilities. If, however, we consider that the boot and shoe industry has 480 employees per $1,000,000 of annual product, whereas, as has already been seen, electric light and power companies have only 190, and if a correction is made for this difference in use of manual labor, it may fairly be said that the discrepancies in capital ratios between these two industries are in very large measure, if not wholly, apparent rather than real.

Load Factor.—While the application of the two rules above stated should make clear that public utility capitalization is not radically inconsistent with that of other business, there are still other factors which, in some cases at least, have a bearing. One of them is what is called "load factor," commonly defined as the ratio of average rate of production in a given period to the maximum rate at any time during the period. For present purposes a modified definition is more appropriate, namely, the ratio of average actual production to maximum possible production, the latter being the product of plant capacity and the hours within the period.

The normal factory aims to operate at capacity, although this is, of course, impossible in times of depression and may not be wholly accomplished in periods of ordinary activity. Capacity operation is secured through delays in filling orders during periods of active business, manufacturing for stock when orders are temporarily scant, and price adjustments which tend to promote or discourage sales. It is not uncommon for factories to specify several months for delivery of large orders of standard products. Public utilities, on the other hand, have no such opportunities to distribute their production, nor to vary their rates to meet business fluctuations. The needs of their customers must be met instantly and without previous notice, and there must be no failure of service at any time. This requires a large investment

in reserve apparatus which is used only in emergency and, therefore, yields only negligible revenue. When a power plant in a mill breaks down, the employees are dismissed until it is repaired.

Public utilities are also subject to abnormal seasonal demands, such as Christmas or other holidays, for which investment far in excess of normal requirements (and, therefore, yielding little revenue) must be provided. The daily load curves of public utilities show wide fluctuations far in excess of those of industrial plants. For many years it has been the persistent aim, particularly of electric power companies, to fill up the "valleys" of their load, including the night "graveyard watch," and these efforts have gone far to overcome the handicap of idle productive investment which, however, still exists and will continue. If one can visualize a manufacturing plant required to manufacture and fill all orders instantly upon receipt at any hour of day or night, with necessary machinery and operatives in readiness, the effect upon investment, to say nothing of cost of production, can well be imagined. In spite of these handicaps, the load factors of electric plants do not compare unfavorably with one-shift industrial operation, although usually much lower than other continuously operated industries.

The statistical data referred to in this connection do not in some cases distinguish holding company capital from capital directly employed in production, resulting in some duplication in investment without proportional duplication in revenue. Holding companies are more common in the utility field than in general manufacturing, and so the comparisons of capitalization made herein are subject to some correction in favor of the public utilities.

Capitalization Not Synonymous with Value.—In spite of often repeated authoritative assurances to the contrary, many people still seem to think that capitalization, as distinct from value, is a factor in fixing utility rates, and that the public is subject to excessive charges because of overcapitalization. Capitalization and value are rarely the same, and this is probably as much true of manufacturing as of public utilities. If the foregoing discussion has indicated probable consistency between public utility and industrial capitalization, it follows that even if capitalization were a factor in rates, the patrons of public utilities would not be more subject to extortionate charges on that account than are the purchasers of industrial products.

PUBLIC SERVANTS

Public utilities occupy a further unique position in the business world in that they are properly classed as public servants. The ordinary business enterprise may be conducted as its owner pleases. He may choose his customers at will, rejecting any who do not meet his requirements or suit his fancy. He may vary the prices of his wares without restraint, charging one customer more than another if he sees an advantage in so doing. If he does not happen to have in stock the particular article which a customer desires, he is under no obligation to furnish it immediately but may offer delivery a few weeks or months hence, if at all. He may extend credit to one customer and refuse it to another.

Public utilities, on the other hand, are under definite obligations to furnish service promptly to every applicant for it, and when a patron is once enrolled, whatever service he contracts for and receives must thereafter be immediately furnished at any time. If the utility's facilities are not directly accessible to a prospective customer, they must within reason be extended to his premises. Furthermore, every customer must be charged the same price for a particular character of service and must be extended credit under strict rules applicable to all other customers.

Public utilities are public servants, not only for the above reasons but, further and more literally, because they work for a certain fixed wage; for, under existing regulatory practice, their rates cover only the bare cost of operation and upkeep of their property plus a return upon its value just sufficient to secure capital. In other words, the profits which other industries may demand at will, subject only to competitive limitations, are denied to public utilities. There are, it is true, compensating advantages to public utilities in such restrictions in that, in theory at least, their earnings are maintained in times of depression as well as prosperity, whereas profits in other industries may disappear.

FINANCIAL STABILITY

Because of recurrent adjustments of their charges to meet business conditions, and for other reasons, public utilities have a record for stability of earnings and return to their investors which is not paralleled in any other line of business and which has attracted many conservative investors to public utility securities.

The other reasons referred to include primarily the stable character of the need for the particular service rendered. Experience demonstrates that the use of street cars, electric light, and gas does not change substantially between periods of business depression and prosperity. Such service is apparently one of the essentials of modern life which cannot be dispensed with during the periods when some economies are necessary. The demand for utility service for industrial purposes is, of course, subject to some fluctuation, but this does not prevent a degree of stability of which the industry may well be proud.

INCOME COMPARISONS

Some specific data to substantiate the comparative stability of public utilities may be of interest. The accompanying chart,

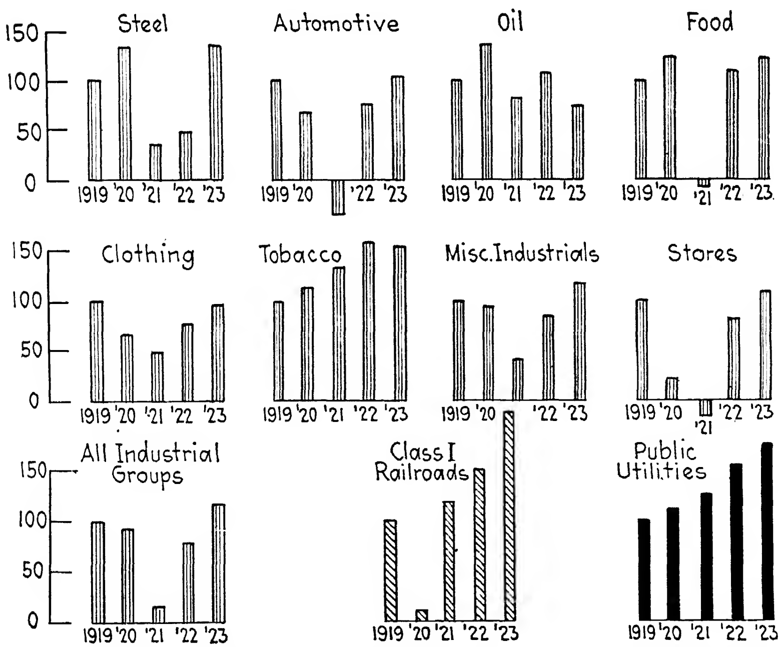

FIG. 2.—Relative net incomes of industrial and mercantile establishments, railroads, and public utilities, 1919 net income = 100.

(Fig. 2), prepared from data published by the Federal Reserve Bank of New York (March, 1924) compares the net income of

certain groups of industries with groups of railroads and public utilities. The data are taken from 109 well-known corporations carrying on a wide range of productive and mercantile activities, divided into eight groups, from 193 class I railroads, and from a public utility group including 94 representative companies of various classes. The data are shown for annual periods from 1919 to 1923, inclusive, thus including years of exceptional prosperity and unusual depression. The year 1919 has been taken as the base, with net income represented by 100, and all other years are shown relatively.

The chart shows that industrial profits varied from a maximum of 160 to a deficit of 36. Every one of the industrial groups except tobacco showed substantial drops below the 1919 standard, all but one of these others falling to 50 or lower. The public utility group, on the other hand, shows gains in net profits each year since 1919, rising to 125 in the depression year 1921, and to 173 in 1923.

More comprehensive data issued by the Treasury Department show that the net income in 1921 of the 541,000 corporations then existing in the United States was less than 1 per cent of their capital. Of the 79,000 manufacturing corporations 42,000 had deficits aggregating nearly $2,000,000,000, whereas the remaining 37,000 had combined net income of only $1,750,000,000. The depression in 1921 caused insolvency of 495 manufacturing concerns, 45 national banks, and 15 savings banks, with combined liabilities of $265,000,000. In that year 9 electric companies went into the hands of receivers with liabilities aggregating $302,000.

The Bell Telephone system is also a good illustration of the stability of public utility income. A recent annual report shows annual net income available for dividends for a period of more than 20 years, fluctuating between about $8.70 and $12 per share. During the entire history of the electric light and power industry there has never been a year when the revenues did not exceed those of the preceding year, a record which few, if any, other industries can equal. Electric railways have at times been an exception to the stability and regular progress above noted. In the years of rapidly rising prices during and following the World War increases in fares, because of franchise restrictions and slow processes of regulation, did not keep pace with rising costs. These abnormal handicaps have now largely disappeared, and

the present level of fares, as compared with the pre-war level, is higher than that of any other class of public utilities. This is necessarily so because of the prevailing high level of wages and the prominence of wages in electric railway operating costs.

STABILITY OF RATES

In spite of the abnormally high level of fares as compared with other public utility charges, it is, nevertheless, true that this level is below that of other factors in the cost of living. Early in 1925 the cost of living was 67 per cent higher than in 1914, whereas street-railway fares were only 47 per cent higher. The average level of electric rates in 1925 was actually lower than that in 1913 by approximately 8 per cent. Gas rates occupy an intermediate position, about 30 per cent higher than in 1913. It has been estimated that the costs of these classes of public utility service make up less than 5 per cent of the per capita cost of living. The percentage applicable only to those within reach of such service would be somewhat higher but still a very small part of their annual expenditures.

References to Supplementary Reading

GLAESER, M. G.: "The Meaning of Public Utility," *Jour. Land and Pub. Util. Econ.*, p. 176, April, 1925.

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CHAPTER III

FRANCHISES

Continuous occupancy of or fixed encroachment upon highways and public places for private purposes is not allowed in our American communities. Even the temporary blocking of sidewalks and sections of streets for building construction requires a special permit. Stands and carts of street vendors must be licensed, and likewise vehicles which regularly use the streets for commercial purposes. Permanent use of public ways with fixed structures such as are required for public utility service involves more complicated forms of permit which are usually known as franchises.

HISTORY

The history of franchise negotiations and grants reveals a confusing conflict of public and private interests in which, until recent years at least, the rights and the obligations of the parties at interest have not been clearly recognized. The real interests of the general public have often been ignored or grossly misunderstood. The present interest in this subject lies primarily not in the issuing of new franchises for new or extended public utility service but, rather, in the renewal of franchises granted in earlier years which are now expiring.

The negotiations for such renewals still disclose much unnecessary controversy and political activities which might well be avoided by a clear understanding of the fundamental purposes to be accomplished and the economic rights of the public, the municipalities, and the utilities. City officials who are responsible for the municipal side of franchise negotiations are busy men, usually not consistent students of economic problems, nor are they generally familiar with the intricate technical problems of public utility service. It is the purpose of this chapter to outline briefly the history of franchise developments and to point out the tendencies and principles which should have recognition in future grants of this character.

Sources of Franchise Grants

Under our system of government, jurisdiction over private property and public highways and works rests primarily in the state. The state may delegate to its political subdivisions, including cities, towns, and counties, such of its authority over these matters as it sees fit. To the extent that such authority is not specifically delegated it remains in the state. In the early days of public utilities no delegation of authority to grant franchises had been generally made, and many of the original grants were obtained through special legislative acts.

As the principle of home rule developed, municipal charters came to include the right of control over city streets, including the granting of franchises. Further evolution discloses a tendency in the opposite direction until at the present time the issue of local franchises in many states is conditioned upon or made effective through the issue of a certificate of public convenience and necessity by a state regulatory board. Such a board may even authorize the use of city streets for utility service, if in the general public interest, when local authorities have refused to grant such rights.

Because of the system of state-wide regulation of public utilities which is now generally in effect, the importance and the significance of franchise grants by local authorities have been materially restricted, and it may be generally stated that, where state supervision over public utilities exists, the rights of municipalities over franchise matters are, in effect, limited to the granting of locations for permanent structures for a specified term under general conditions and service requirements. In some localities there still exists the necessity, before franchise grants become effective, of securing the consent of the property owners along the streets to be occupied. This requirement has often caused unwarranted expense and annoyance and retarded or prevented public service which the majority of citizens to be served desired. The tendency is for such restrictions to disappear with the development of modern regulatory methods which give such recognition as is consistent with the general public interest to the rights of individuals to freedom from unnecessary noise and inconvenience.

There still remains a considerable number of states in which the cities maintain authority over franchise grants or where the alternative jurisdiction of regulatory commissions has not been

exercised. For such cases and others where negotiations for new or renewed franchises may be required, it will be of interest to summarize briefly the specific terms and conditions found in the conventional franchises.

STANDARD PROVISIONS

Electric and Gas.—Of the classes of public utilities considered herein, electric and gas companies have the simplest franchise requirements. Usually these utilities are not definitely restricted as to their locations but are authorized to install their overhead or underground structures on any city streets where service is desired. They may be required to make extensions of their facilities to reach prospective customers, involving considerable expense, sometimes with the proviso that such extensions may be expected to become profitable within a reasonable period and will not, even at the beginning, unduly curtail the net income from the business as a whole.

It is common for the cities in granting rights for poles and underground conduits to require that the utilities reserve certain space for municipal fire alarm, police signal, and other necessary wires. The city may also require that utilities of various classes having overhead construction shall make joint use of poles to the end that unnecessary obstruction of the streets may be avoided. It is also customary for cities to reserve the right to require the removal of overhead poles and wires and the substitution of underground construction where sections of the city become congested and where overhead structures would seriously interfere with traffic, fire department operations, and otherwise.

Earlier franchises frequently fixed a maximum rate which could be charged for the public utility's product. Such stipulations are now uncommon, since it is generally, although not universally, held that franchise as well as statutory rates are not necessarily binding and may be abrogated in the public interest by regulatory commissions.[1] Such abrogation is not, as some people have thought, a breach of the contract between the city and the utility. It is, rather, the exercise of authority by the state, acting for the city, to waive such contract rights as are deemed to

[1] *Re Union Dry Goods Co.*, 248 U.S. 372; *Re San Antonio Public Service Co.*, 255 U.S. 547; P.U.R. 1921 D, 412.

be contrary to the best interests of the city. Where such interests would not be served by a waiving of contract terms, the interests of the utility in such waiving are not controlling.[1]

Railways.—Electric railways require more specific franchise provisions. Ordinarily, they are granted certain definite locations for their tracks in the city streets and cannot occupy other streets without supplementary grants. The motive power to be used for car operation is usually stated, and the type of cars and their equipment, the heating of the cars, and the use of safety devices may all be specified. Recent franchises have been sufficiently broad in conditions respecting rolling stock to permit the use of railless vehicles instead of cars on conventional tracks, these vehicles being either trackless trolleys or motor buses.

This practice is in recognition of the principle that the common-carrier service of a community can be conducted most economically by one coordinated transportation system, using such facilities as are best adapted to each district or route. This principle is endorsed in the report of a special committee of the Chamber of Commerce of the United States, made in November, 1923, after an exhaustive study of motor transportation. A franchise for a local railway may obligate the grantee to permit an interurban railway desiring to enter the city to use the local tracks as far as may be necessary under an equitable rental agreement.

Paving.—Older railway franchises had the almost universal requirement that the railways, when the streets which they occupied were paved or repaved, should pay the cost of the pavement between and adjoining their tracks, usually extending 1½ or 2 feet outside the rails. This paving requirement—logical and proper in horse-car days—has been the subject of much controversy and discussion, and it is now generally regarded as an unjust burden. It has been so held by many regulatory commissions and courts and by the Federal Electric Railways Commission in its report rendered to the President in 1920. This subject is of such paramount importance to electric railways and their patrons that it will be given further extended attention in Chap. XI dealing with taxation, to which it appears to be related. Similar further discussion will also be had with reference to

[1] *Re Columbus Railway Light & Power Co.*, 249 U.S. 399; P.U.R. 1919 D, 239; *Re Georgia Railway & Power Co.*, 262 U.S. 432; P.U.R. 1923 E, 387.

requirements, found in a number of franchises, for the cleaning and sprinkling of streets occupied by tracks.

Franchise Tax.—Another feature frequently found in franchises of various classes, but more commonly applicable to electric railways, is the franchise tax. In the early days of public utilities, before regulation came into effect, the public utility business was publicly regarded as a particularly profitable one and the municipalities sought to capture a part of these profits on the theory that in so doing they were not burdening the users of the public utility service but, rather, taking from the utility's stockholders a part at least of the excess of profits over those normally obtainable in other business ventures. Under regulatory methods, which will be considered in detail in another chapter, the situation has radically changed and public utility rates are fixed to cover the cost of service, including, among other elements, all taxes such as those referred to. These taxes are, therefore, paid by the patrons of the utilities who thus make a special contribution toward the administrative costs of the city in addition to their regular taxation. The injustice of such an arrangement will also be further considered in the subsequent chapter on Taxation.

Instead of assessing an annual franchise tax of a certain fixed sum or percentage of revenues, it is the practice in certain states[1] to require a lump-sum payment for the franchise at the time of its issue, and the franchise may be the subject of competitive bidding or public auction. Such a procedure has little to recommend it from the municipal point of view and may be more objectionable to the utility than annual payments. In lieu of or supplementary to annual cash payments for franchise grants, it is quite common to find in these franchises a provision for free service to the municipalities or their agents. Such free service includes transportation of policemen, firemen, and other uniformed municipal employees, and, in some cases, a considerable number of other persons; and free or reduced-rate lighting of municipal buildings and public places. All such free service is, in effect, an assessment of taxes for municipal administration through the railway as a collector, thus forcing car riders to pay more than their proportion of taxes. It may not be unreasonable to exempt policemen and firemen from cash-fare payments, but the cities might

[1] Kentucky Constitution, Sec. 164.

in justice to car-riding citizens, make a lump-sum, monthly, or annual payment for such transportation.

Superfluous Regulations.—When the scope of existing regulatory powers of the states is comprehended it will be clear, as already stated, that many of the conventional franchise terms are wholly superfluous in that they add nothing to the rights of a municipality to require, under reasonable rate schedules, adequate and safe service and reasonable facilities and their extension to meet the needs of growing communities. Any possible simplification of franchise negotiations, through the omission of superfluous provisions, will clarify and expedite consummation of the agreement, leaving to better qualified state authorities the adjustment from time to time of problems of service, facilities, and rates.

Arbitration.—A feature common to all forms of franchises is that of arbitration of disputed points. It is not practicable in a franchise, any more than in any other form of contract, to provide definitely for all possible contingencies. Such matters in controversy as cannot be settled by direct negotiation between the parties are, therefore, referred to arbitration proceedings consistent in form with those found in other kinds of contracts. Each party selects an arbitrator, the two parties agree upon a third, with the usual provision for taking care of vacancies or failure to appoint, and, after due hearings, the board makes its findings which are binding upon the parties. It is not uncommon to reserve certain specific features of the franchise from the rights of arbitration.

Assignment.—Franchises usually provide that their rights inure to the grantee, its successors, or assignees. In this way, through consolidations and otherwise, many existing utilities possess a large number of grants, some covering the same territory and varying in restrictions and conditions. By electing to operate under those franchises having most favorable conditions and duration, questions of franchise restrictions and renewals are sometimes postponed for considerable periods.

Term.—Another important feature of franchises is the term or life of the grant. When such grants were secured through legislative acts, they were in many cases without express limitation, and the courts have generally held them to be perpetual.[1] The

[1] *Re Denver Tramway Co.*, 3 Fed. (2d) 285; *Elec. Ry. Jour.*, Dec. 20, 1924, p 1057.

same is true of many early grants by municipalities. In a few cases specific grants for very long periods, such as 99 or even 999 years, were made. Experience has indicated that such perpetual or very long grants are undesirable. In fact, public sentiment has so strongly turned against them that there are state constitutions which now prohibit irrevocable or uncontrollable grants or which limit the life of all grants to comparatively short periods, such as 25 years. Even where constitutional or statutory limitations are not found, the municipalities have thought it expedient to limit the life of franchises to periods usually not exceeding 50 years, and frequently much shorter periods.

There are definite and forceful objections to short-term franchises. It must be remembered that public utility property is in large part fixed and cannot be removed for use elsewhere without prohibitive expense, and that no one expects the service which the franchise covers to cease when the franchise expires even though existing owners are not favored. Therefore, upon the expiration of the right to retain and use such property in public streets, the utility is at a decided disadvantage in negotiating for a renewal of its franchise. City officials have not infrequently taken advantage of their strategic position and insisted upon drastic revisions and radical concessions which would make future profitable operations impossible.

Public utilities have sometimes yielded in part to these restrictions to the ultimate disadvantage of all parties concerned. In a few cases service has been suspended and removable facilities taken away until the cities awoke to the fact that the service in question was essential to community life and that drastic requirements for continued service could not be enforced. Such ill-advised and costly wrangling over franchise renewals has been an unfortunate and discreditable factor in public utility history, the responsibility for which it is not necessary at this time to fix.

Financial Difficulties.—A further disadvantage in term franchises is the difficulty in long-term financing which becomes more and more acute as the expiration of the franchise approaches. It is not so easy to sell term obligations running beyond the expiration of the franchise. Financing may, therefore, be limited, during the later years of the franchise term, to the more costly short-term obligations or bank loans, the inevitable result being that needed extensions of the property are neglected and service deteriorates to the serious disadvantage

of both community and utility. Under modern regulatory methods, however, this objection to expiring franchises has lost much of its earlier significance through the broad protection exercised by the commissions.

TERMINABLE PERMITS

Admitting that perpetual and very long-term franchises are undesirable, there still remains a relief from the evils of a short term, which experience has shown to be not only practicable but satisfactory. The alternative in question is the so-called indeterminate or terminable franchise or permit, the essential feature of which is the continuance of the grant so long as the utility will furnish adequate service at reasonable rates or until the municipality purchases the property under prescribed conditions which protect the investors therein. The essentially permanent character of the service involved is recognized in this arrangement.

Under this form of franchise the recurrent controversies over renewal terms are wholly avoided, and necessary new financing may be undertaken at any time with assurance that the participants will be secured against loss. In some cases there is further protection to the utility and its investors through a formal or tacit provision that competition in kind will not be permitted in connection with a terminable franchise. This feature of exclusiveness is not unique, for a considerable number—although a small percentage—of term franchises provide for monopoly rights.

Legal Status.—Grants of the terminable form cannot, in general, be made by municipalities without express statutory provision. Such provision is now found in not less than seven states, and it is to be expected that other states will follow this example as the success of terminable operations becomes more and more evident until the older form of term franchise disappears. The National Association of Railway and Utilities Commissioners, an unofficial organization of the members of the various regulatory commissions and, therefore, identified with the official opinions of the commissions, gave consideration to this subject at its annual convention in 1922 and expressed its approval in the following language:

WHEREAS, it is desirable in any state wherein public utilities are subject to regulation by a state commission that the franchise or ordinance condi-

tions under which the various utilities operate shall be uniform and harmonious so far as possible, to the end that there may be uniformity of treatment of the utilities on the part of the commissions; and

WHEREAS, under the present system of limited-term franchise, it is often difficult for a utility to finance itself and to sell its securities to investors; and

WHEREAS, the principle of the "indeterminate permit," in the judgment of this Association goes far towards solving the difficulties hereinabove suggested, provided ample safeguards be made for the protection of the public and the investors in case of the termination of such permit:

NOW, THEREFORE, RESOLVED: That it is the sense of the National Association of Railway and Utilities Commissioners that the principle of the "indeterminate permit" is economic and sound and should be adopted in the legislation of the various states relating to public utilities; and

RESOLVED FURTHER: That this Association do, and it does hereby urge the Legislatures of the various states which have not as yet adopted the principle of the "indeterminate permit" to enact legislation recognizing and putting such principle into effect.

Conversion.—Under existing arrangements terminable permits are not limited to new or renewed grants, but the holder of an unexpired-term franchise may surrender his existing rights and substitute the terminable form. Such substitution in some cases involves relief from certain burdensome restrictions, such as paving requirements, contained in the surrendered grants.

Advantages.—That terminable permits protect and promote the public interest and have not been designed to help the public utilities alone should be clear from the resolution of the Commissioners just quoted, and from equally favorable comments of many other prominent public officials. When Wisconsin first authorized this form of franchise as an optional alternative to existing rights, less than 50 per cent of the regulated utilities accepted it. This form was later made compulsory in Wisconsin but a recent decision of the United States Supreme Court has held that such compulsory surrender of existing contract rights was unconstitutional.

In states which have not yet authorized terminable grants it is still possible to secure a part of their advantages, and this has been done in certain cases. In Cleveland, in connection with a 25-year term franchise, it was provided that at 10-year intervals the city should have the option of extending the life by 10 years or of giving up certain important control over fares and service. If the term is regularly so extended (and this has already been done on the one occasion which has so far arisen), the company always has at least 15 years of franchise life ahead of it.

SERVICE AT COST—RAILWAY

There remains for consideration a comparatively modern form of franchise which has found popularity in the electric railway field and limited application to other public utilities. The so-called "service-at-cost" franchise was developed to provide a prompt and automatic adjustment of fares to meet the cost of service. The extent and the character of service are made subject to municipal regulation, and the railway has no ground for protest against liberal service so long as fares are automatically adjusted to cover whatever grade of service the patrons are willing to pay for.

It may be contended that service-at-cost franchises accomplish no more in the way of fare regulation than does the more common jurisdiction of regulatory commissions. While there are no fundamental differences in method, the feature of automatic fare adjustment has decided advantages over the usual procedure of recurrent rate hearings, valuations, and deliberate consideration by the commissions, often involving delays of many months, whereas the automatic adjustment gives prompt relief from excessive or inadequate fares.

There is also satisfaction to the community in fixing the extent and character of service which it desires directly rather than through the process of appeal to a state regulatory commission. Furthermore, such an arrangement makes an appeal to the home-rule instinct which is pronounced in certain parts of the country. Because of the prominence which has been given to service-at-cost franchises in recent years and their endorsement by the Federal Electric Railways Commission and many other prominent people, it is desirable to go into the details of these franchises at some length so that their advantages and limitations may be fully understood.

History.—Before discussing these details, it should be stated that railway franchises involving at least some of the typical service-at-cost features are effective (as of the dates shown in parentheses) in the following prominent American cities:

Chicago, Ill. (1907).
Cleveland, Ohio, (1910).
Kansas City, Mo. (1914).
Dallas, Tex. (1917).
Montreal, P. Q. (1918).

Cincinnati, Ohio (1918).
Massachusetts (legislative acts, 1918).
Youngstown, Ohio (1919).
Memphis, Ten.. (1920).
Toledo, Ohio (1920).
Rochester, N. Y. (1920).
Des Moines, Iowa (1921—later enjoined).
Louisville, Ky. (1922).
Grand Rapids, Mich. (1922).

The above cities have been here listed because various special features of their franchises are to be referred to in the discussion which follows. In several other less prominent cities some service-at-cost features have been embodied in franchise renewals. A considerable number of other cities have given the matter careful consideration and have either rejected the specific plans presented or still have the matter under consideration. Among these cities are: Denver, Minneapolis, St. Paul, Indianapolis, Houston, Buffalo, New Orleans, Syracuse, Pittsburgh, Norfolk, Akron, Milwaukee, Vancouver, and Ottawa.

General Features.—The intent of these service-at-cost franchises is that the fares collected shall always meet as closely as possible the cost of the service rendered. The cost in question includes current operating expenses, all taxes and imposts, provision for permanent upkeep of the property, cost of municipal supervision, and return upon the established value of the property.

Valuation.—Obviously, the value of the property is an important factor in these franchises. It has usually been determined by an appraisal or by accounting records of investment, but in a few cases the outstanding and future issues of securities are made the basis of return to investors. Valuations fixed in the various franchises cover quite a wide range, running from slightly over $50,000 per mile of single track to nearly three times that amount. In certain cases the investment or appraised value was reduced by a very substantial percentage in the final settlement of this frequently disputed factor. The reduction in the Cleveland case was 30 per cent.

After the initial capital value is determined, this value at any later date is found by adding the cost of additions to the property and deducting the cost of property retired from service. This is the usual procedure, but in one or two cases, notably Cleve-

land, the property retired is credited, not at the amount at which it appeared in the original capital value, but at the estimated cost of replacement at the time of retirement. By this process any deficiencies in the original valuation because of accrued depreciation or otherwise are permanently retained.

Rate of Return.—The authorized return upon the established value, which enters directly into the cost of service, varies in the different franchises between quite wide limits, and in its method of application. The original Chicago grants to the two independent railway systems then operating provided a return of 5 per cent upon the capital value, plus 45 per cent of profits remaining after all designated costs had been provided for out of the established 5 cent fare. Cleveland has a 6 per cent return upon that part of the capital value represented by stock, and actual interest requirements on the balance. This 6 per cent has proved inadequate in recent years, and an increase to 7 per cent was approved by arbitration but rejected at a referendum.

Youngstown has a 7 per cent return upon initial capital and actual cost for all additions. Dallas has a sliding scale of return from a minimum of 7 per cent to a maximum of 9 per cent, the rate varying inversely with the fare in effect. Other franchises also provide a profit-sharing or sliding-scale return for the purpose of offering an incentive to efficiency in the conduct of the business. The desirability of such incentive and the failure of the various plans in effect to provide it will be given later consideration.

Expenses.—The operating expenses which are included in the costs of service are, in the majority of cases, the reasonable expenses actually incurred by the railway. In a few cases conformity to a budget program is required. The Cleveland grant is unique in providing in the franchise itself a fixed limitation on a car-mileage basis for operation and upkeep cost. This limitation has not proved satisfactory and, in spite of several readjustments to meet changing conditions, the company has very commonly found it necessary to spend more than its allowance amounts in order to furnish the prescribed service. The Montreal grant also provides for a car-mile allowance, but it is fixed annually in advance by the supervisory commission and excess costs may be approved by it if found to be reasonable. Where close supervision of operations and accounting is provided through competent and honest officials there would seem to be no occasion for franchise limitations upon operating expenditures.

Reserves.—Most but not all the franchises provide for reserves for renewals and replacements or combination reserves for maintenance and renewals. Some prescribe a fixed percentage of revenues or investment; others have flexibility in the annual appropriations for these purposes in the light of existing revenues, return to investors, or the extent of accumulated reserves. The Dallas provisions for combined maintenance and replacements are particularly interesting. The minimum appropriation for these purposes is fixed at 10 per cent of the revenues. For each 1 per cent in annual return paid to investors in excess of 5 per cent on the capital value, the annual appropriations to the reserve must be increased at the rate of 3 per cent up to a maximum limit of 18 per cent of annual revenues, except that past deficiencies under 18 per cent may be made up. It is not intended, however, to maintain an accumulated reserve beyond certain specified limits varying with the rate of fare in effect, the maximum amount of the reserve under any conditions being 10 per cent of the property value.

Amortization.—The authorized cost of service includes actual taxes paid, rentals of property or equipment used in the company's operations, and the services and expenses of the supervisor and his staff within prescribed limitations. Certain franchises include provisions for amortization of capital which are deserving of attention. Typical illustrations are the Kansas City franchise (since modified in substantial respects) and the Toledo grant. The Kansas City initial capital value contained an item of over $6,000,000 for intangible elements, principally franchise value and development cost. It was agreed that these elements should not be a permanent factor in the cost of service. To the extent that they represented the value of the surrendered old franchises they should be amortized by 1925 when these franchises would have expired. To the extent that they represented unrecovered early losses the necessity for amortization is not so clear. There is no unanimity of opinion as to how, if ever, early losses by regulated public utilities should be made up from subsequent revenues. Such a utility may take care of its inevitable early losses in one of three ways:

1. By maintaining abnormally high rates during a succeeding more profitable period.

2. By never recovering the losses themselves but indefinitely earning a return thereon.

3. By gradually but not regularly charging off the losses, together with a return on the unamortized balance, from the profits of supernormal periods.

The first method involves injustice to the patrons of the period considered because no convincing reason can be given for singling out these particular patrons rather than others for this unusual burden. The second method is not unjust to any patrons because it uniformly and indefinitely distributes the burden of early losses, but, although it is economically sound, it has frequently met with pronounced opposition. The third method, confessedly a compromise, has much to recommend it from a practical point of view even if it is not in conformity with conventional accounting practices. It agrees closely with the general practice in unregulated competitive business.

The Kansas City franchise adopted this third method by devoting a portion of the profits in excess of a 6 per cent return on the capital value to the amortization of the intangible capital. The Toledo franchise includes a sinking fund through which outstanding bonds of the company are to be retired up to 20 per cent of the total capital value, the retired bonds being replaced by escrow common stock which becomes the property of the city. In this case an amortization of investment in physical property directly used in the public service is contemplated. The result is a reduction of the capital value for the benefit of distant future users of service at the expense of the present users.

It is difficult to justify such shifting of cost burden from one generation to another. The present generation is not lacking in liberality of expenditures, but it is very doubtful if a specific referendum vote would show a desire to shoulder any substantial part of the burdens of the next generation in addition to those which properly attach to the present. In Toledo the contemplated 20 per cent reduction in capital value will correspondingly reduce the return, which may amount to about one-third of the total cost of service, and so the future rate of fare will be reduced by something like ½ cent at the expense of present riders. It is obvious, therefore, that provisions of this character should be introduced in service-at-cost franchises only after the most careful analysis of their purposes and results and full knowledge on the part of present patrons of the utility of the abnormal obligations which they are assuming.

Barometer Fund.—The items of cost above enumerated are those which are ordinarily to be covered by the fare schedule at any time in effect. It is, of course, not possible that the fare in any month can be adjusted to fit the cost of service in that month because this cost is not known until about the middle of the following month, nor is it desirable that the fare shall be exactly adjusted to meet the cost of the nearest preceding month for which this cost is known, for this would involve odd fractions of a cent which are impracticable.

It is further undesirable that fares should be frequently changed to cover minor changes in cost of service. Provision is, therefore, made in all service-at-cost franchises for a popularly called "barometer" fund of considerable size, which fund may increase or decrease within prescribed limits without any change in fare. If costs are greater or less than revenues in any month, the differences are taken from or added to the fund, which is more properly referred to as a reserve—for it is not necessary to maintain a corresponding amount of cash at all times—and herein more specifically referred to as the fare-stabilizing reserve.

The various franchises provide that, when this reserve has reached a specified upper limit, fares shall automatically be reduced. It is usually required that all subsidiary reserves, such as those for accidents and property retirements or replacements, as well as any past deficiencies in return or other requirements, shall be made good from the reserve before the upper limit is recognized for fare-reduction purposes. On the other hand, when the reserve has reached its lower limit, an automatic increase in fares takes place.

Some franchises provide that, if a given change in fare fails to diminish or increase the reserve by certain margins from the upper or lower limits, further decreases or increases in fare shall promptly go into effect. In other cases it is provided that when the upper or lower limits of the reserve have been reached, fares shall not be changed unless a tendency to increase or decrease in the reserve has prevailed for a substantial period of time. The purpose of this latter provision is to prevent a change in fare due to purely transient conditions, which change would only be temporary.

The size of the fare-stabilizing reserve, and more particularly the range between its upper and lower limits, are fixed with a view to infrequent changes in fare, and in a few cases it is required

that changes be not made more frequently than six months. The majority of these franchises fix the normal amount of the reserve and its upper and lower limits in dollars. Others have the more logical arrangement of fixing the normal amount as a certain percentage of the capital value, with the upper and lower limits at a determined percentage, usually 50 per cent, above or below the normal. Such an arrangement avoids the complications of more frequent changes in fares in future years when the volume of business has increased out of proportion to the fixed limitations upon the original reserve. A few franchises have related reserves intended further to stabilize fare schedules, but ordinarily their advantages do not justify the complications involved.

Table V illustrates the way in which the stabilizing reserve is set up and maintained in several service-at-cost franchises:

TABLE V.—CHARACTERISTICS OF FARE-STABILIZING RESERVES, THE FARE "BAROMETERS" IN SERVICE-AT-COST FRANCHISES

City	Normal reserve		Range between upper and lower limits	
	Amount	Per cent of capital value	Amount	Per cent of either limit from normal
Cleveland	$ 500,000	..	$400,000	40
Dallas	....	8	....	50
Toledo	....	4	....	25
Cincinnati	400,000	..	400,000[1]	62.5 37.5
Boston	1,000,000	..	600,000	30

[1] $250,000 above normal; $150,000 below normal; all other specified ranges are divided equally above and below normal.

Fare Schedules.—The automatic changes in fares above referred to are made from one step to another of schedules stated or described in the franchise. The simplest form of schedule is one with fares varying in ½ cent steps, the fractional steps being taken care of by tickets. The more common schedules have fares in even cents, supplemented by ticket rates or charges for transfers, or both, the intent being that the several steps shall be

not more than 10 per cent apart. While in some cases a specific schedule of fare steps is given without provision for higher or lower steps, it is now more common to set up such steps as will probably be useful and give to designated officials the power to establish additional lower or higher steps consistent with those originally established. An alternative is to leave entirely in the hand of such officials the determination of the fare system with possibilities of fundamental future changes from the scheme in effect, with only the provision that at all times one or more steps above and below that in effect shall be in readiness.

Supervision.—Operations under franchises of this character do not take care of themselves as far as the public is concerned. Someone must be responsible for the maintenance of service satisfactory to the public and for accounting and other functions consistent with the requirements of the franchise. It is, therefore, customary to establish the office of supervisor to have general direction of service, construction, accounting, etc., in the interests of the city but at the expense of the utility. Ordinarily, one supervisor is considered sufficient, but where very large operations are involved three or more are occasionally employed. Where three are employed, one is usually designated by the company, one by the city, and the third (who may be a transient member for controversial matters only) is agreed upon by the two parties. A single supervisor representing the city ordinarily reports to the mayor or city council, and the extent to which the rights and powers of the city are delegated to him rather than reserved by the city council is widely variable.

An interesting and significant method of supervision is in effect in Memphis, Tenn. A state commission has jurisdiction over the operation of public utilities in Tennessee, and was appealed to, to fix fares and operating conditions in Memphis. The Commission determined the value of the property, fixed a rate of return and other essential service-at-cost features, and itself appointed a supervisor to have charge of operations under the direction of the Commission but located in Memphis and accessible to city officials and citizens as well as the railway company. This arrangement seems to be the logical working out of service-at-cost provisions in states having regulatory commissions. These commissions are apt to be jealous of local regulation which tends to limit their own functions, and properly so where these functions are definitely established by statute.

As illustrating this situation reference may be made to a service-at-cost agreement worked out in detail between the City of Philadelphia and the Philadelphia Rapid Transit Company in 1918, which embodied in many respects the most equitable and commendable forms of service-at-cost operations so far devised but which was disapproved by the Pennsylvania regulatory commission as being inconsistent with the obligations conferred upon it.

A franchise, effective in 1922 in Fresno (Cal.), is also of interest. In approving this franchise the California Railroad Commission pointed out that, although it could not legally be bound by the terms, it would give due consideration in any proceeding brought before it to the agreement between city and railway expressed in the franchise with respect to value, rate of return, extensions, and other matters.

Certain other franchises, notably Montreal, have specified the public service commission as the board of appeal or final authority in cases of differences of opinion with respect to interpretation of the franchise and operations thereunder. This is logical as far as it goes, but the Memphis arrangement has advantages in removing the supervision from too intimate contact with local political conditions, and in further providing for greater continuity of supervisory policy than would be practicable under local control with the usual recurrent changes in personnel In short, the Memphis arrangement embodies the advantages of state-wide regulation and avoids as far as is desirable the objections to remote control and delay in effecting needed changes in rates or service.

City Purchase.—A very common, although not universal, feature of service-at-cost franchises is the right reserved to the city in which operations are carried on to purchase the property of the grantee after due notice. In some cases this right does not become effective until after a period of years. In others it may be exercised annually after a notice of six months or more. In still other cases the city may either purchase for itself or select a substitute grantee, the latter alternative being intended for protection against operations under the existing grantee which may be persistently unsatisfactory.

The price to be paid for the property is usually defined in the franchise, although it may be the subject of arbitration proceedings or determination by the public service commission of the state. When fixed in the franchise it is usually the initial capital

value plus net additions thereto to the date of purchase, plus, in many cases, a percentage allowance for liquidation of the grantee with the customary adjustment of current assets and liabilities. Any existing reserves created from revenues and not financed by the grantee remain with the property.

It has already been pointed out that in certain cases sinking funds or a share in the profits from operation are accumulated by the city toward the purchase of the property, or are used to reduce the capital value of the property, which has the same effect. So far no muncipality has exercised its right of purchase under any service-at-cost franchise. This right, however, has its advantages in the assurance thereby created that the city may at any time relieve itself from the results of persistent evasion of obligations, unsatisfactory service, or other derelictions on the part of the grantee. On Apr. 7, 1925, the voters of Chicago, by a majority of about 100,000 in a total vote of 560,000, disapproved a plan of the city administration for trustee operation of existing surface and elevated lines, their ultimate acquisition by the city, and the construction of new rapid transit lines. This action was taken in spite of the fact that the surface lines had paid to the city under their 1907 franchises the sum of $40,000,000 for municipal acquisition purposes.

Paving.—A significant feature of the more modern franchises of this form is the omission of some at least of the special burdens imposed upon electric railways under the older forms of franchises. The particular item of interest is paving. There is a definite tendency to omit the obligation to pave or repave in connection with track construction, except where paving is disturbed by railway operations. Requirements for street cleaning and sprinkling are also commonly omitted, as are likewise, with a few exceptions, the special license taxes already referred to, which are to be further discussed.

Subsidies.—Not only is there omission of such special taxes and charges as those above referred to, but certain grants, effective or proposed, have gone further in relieving the grantees of rentals on city-owned rapid transit facilities during early years when the revenues are insufficient to cover the full cost of service. In certain other cases municipalities have gone even further than relief from conventional or normal charges and have developed a plan of actual contributions to railways toward the cost of service otherwise unremunerative. This is best illus-

trated by the practice in Massachusetts, where, under a recent statute, cities and towns are authorized to make contributions toward operating costs of electric railways to the extent in any one year of 50 cents and $1, respectively, per thousand dollars of assessed valuation.[1]

Guaranteed Return.—It remains for the Boston Elevated Act to take one step even further in the direction of insuring adequate revenues. This Act[2] authorizes increases in fare to cover increased cost of service at certain stated intervals. If, in the meantime, or for special reasons, the revenues are insufficient to cover the full cost of service, the trustees may call upon the treasurer of the state to advance sufficient funds to make up the entire deficit. The treasurer, in turn, assesses the amounts so advanced against the cities served in proportion to their use of the service furnished.

It is the intent of this Act that any such assessments shall be restored from future earnings when fares are adequate for the purpose, but no time limit is set for such restoration. Under the operations of this Act the state has advanced sums aggregating nearly $4,000,000, of which about $2,350 000 still remains to be returned. Such cases as those above mentioned are illustrative of a definite change in public sentiment toward the public utility industry and a recognition of its essential character and the necessity of public support under certain circumstances.

Criticisms of Service at Cost.—Although further detailed consideration of this subject is not possible, it will be of interest, before passing on, to point out the recent general tendencies in these franchises and some of the reasons why unfavorable action has been taken upon proposed agreements or favorable action has been deferred. The claim has been made that in certain cases service-at-cost operation has been conducted without proper regard for reasonable limitations in wages and salaries, for the procuring of necessary supplies at lowest obtainable market prices, and for the utilization of labor, materials, and appliances in accordance with the best modern practice—all because the return to investors is not decreased by such laxity or increased by special efforts for efficiency.

This charge, if correct, is a serious one. If, on the other hand, a study of service-at-cost operations shows that inefficiency has

[1] Chap. 288, Special Acts of 1918.

[2] Chap. 159, Special Acts of 1918.

not been in evidence but that costs of service and fares compare favorably with those existing elsewhere under similar conditions, this objection cannot be held to apply to service at cost any more than to other methods of operation. Careful studies which have been made by various independent investigators of service-at-cost operations indicate that, when due allowance has been made for local conditions, favorable or otherwise, the charge of inefficiency has not been sustained. It should be further pointed out that service-at-cost operation does not differ essentially from the conventional regulatory methods except to simplify and expedite the results which both seek, from which it follows that any deserved criticism respecting efficiency applies equally to ordinary regulatory methods.

Lack of Incentive.—Underlying such criticisms, however, there is a real defect which so far has not had adequate remedy. There exists in most service-at-cost franchises a lack of real, definite incentive toward maximum efficiency and usefulness. The *Report* of the Federal Electric Railways Commission, although endorsing the principles of service at cost as one means of solving the electric railway problem, points out existing limitations in the following language:

> Generally speaking, the main criticism of this form of contract is that it tends toward inefficiency and uneconomic operation; that it contains no provision for the control of strikes, or uninterrupted service; and that labor and management may cooperatively increase the cost of operation to the point where the public may be unduly burdened.[1]

The Indiana Public Service Commission, in an investigation of railway service in Indianapolis, included the following statement with reference to the application of service at cost to conditions in that city:

> We have been unable to find or agree upon any plan of operation on the basis of service at cost which would furnish the incentive of private ownership in an operation of service at cost. The result of our investigations generally has been to raise a most serious question and doubt as to the wisdom of the service-at-cost plan. The inevitable tendency seems to be for the operator or company readily to accept increased cost of operation with the view that it can be passed on to the public by higher fares. Such a course results only in adding to the burden of the public.

While, as already stated, the results of independent investigations and the frequent resistance, through arbitration or

[1] *Proc. Fed. Elec. Rys. Comm.*, 1920, vol. 3, p. 2287.

otherwise, to increases in wages, material costs, taxes, etc., which service-at-cost records disclose, do not lead to the conclusions reached by the authorities quoted above, it is obvious that there would be tangible advantages in an incentive provision more effective or workable than those heretofore devised.

Incentive Provisions.—Existing provisions of this character generally take the form of a higher rate of return when low rates of fare are in effect, or a minor share in surplus earnings above a base rate of return. In one case (Montreal) a slight increase in return is authorized when the railway has operated for a fiscal period within the limits of the established operating budget.

The difficulty with the usual incentive clause is that fares are high or low because of changing costs of labor or material in the public markets, which are usually accompanied by corresponding changes in the cost of money. When money, as well as materials and labor, is high, the return authorized to investors by these incentive provisions is low, and, inversely, when money, as well as materials and labor, is low, the authorized return is high. The opposite relation should exist in order continuously to attract new capital. If money rates did not change with other market commodities, such accentuation of financing difficulties would not occur, and the incentive provision to keep operating costs and fares as low as possible would be effective, as in part it may be under reasonably stable business conditions, in spite of the handicaps imposed. A wholly effective substitute has so far not been tried.

A Suggestion.—An incentive suggestion was made in connection with a recent franchise negotiation which is interesting in its possibilities. This incentive program was based upon the assumption that railway costs of service tend to increase substantially in proportion to costs in other productive industries, and that, if some measure of such other costs can be established, the relation between the two costs might be made the basis of a supplementary return to investors. The difficulties of establishing a measure of general costs in industry are obvious. The most logical basis appears to be the weighted average wholesale prices of commodities as represented by index numbers, such as those regularly published by the United States Bureau of Labor Statistics.

Before the World War this index number was fixed at 100. At that time a 5-cent fare was in practically universal use on

electric railways throughout the country, and the many investigations of electric railway conditions indicate that this fare was not unreasonably profitable. The ratio between the wholesale index number in 1913 and the prevailing cash fare (in cents) was 20 to 1. Since 1913 the wholesale index number increased to a monthly maximum of nearly 250 per cent and is still above 150. Electric railway fares, however, average appreciably less than 50 per cent above the pre-war level. The lower it is possible to keep fares in proportion to the commodity index number the more efficient electric railway operation would appear to be. If, for example, with a wholesale index number of 160, a 7-cent fare is maintained, a ratio of about 23 to 1 exists instead of 20 to 1, which prevailed before the war.

In the proposed franchise draft referred to above a supplementary return of 1 per cent was authorized when the ratio of wholesale index number to average fare was 30 to 1 or higher. It became zero with a ratio of 20 to 1, or lower, and was uniformly variable for the ten steps between these two limits. With a ratio of 23 to 1 the supplementary return would be 0.3 per cent. If, with the same index number, it were possible to reduce the average fare to slightly less than 6½ cents, the supplementary return for incentive purposes would be 0.5 per cent.

The complications and lack of ready, general understanding of an incentive program of this particular form may be prohibitive, but if a workable and easily understood incentive plan, embodying some such principles as those stated, could be developed, it would serve a very useful purpose and would eliminate the most common criticism so far made against service-at-cost operations. The best of human efforts are not exerted without a hope of reward as the result. This is just as much true in the public utility field as in any other human activity. The great accomplishments in our history have been in fields where opportunities for pioneer research, aggressive activity, and wise foresight, with resulting pecuniary profit, have not been restricted.

OTHER SERVICE-AT-COST PLANS

So far consideration of service-at-cost franchises has been limited to electric railways. This principle has been embodied in only a few franchises for other forms of public utility service. The sliding-scale principle, adopted years ago by the Boston

Consolidated Gas Company, is well known. It provides for a base price of gas and a corresponding base rate of return to investors. For each 5-cent decrease in the price of gas, investors were authorized to take out an additional 1 per cent in return, and were correspondingly required to reduce their rate of return for increases in the price of gas. Such a plan is workable and furnishes an incentive to efficiency, provided the base price of the product and the corresponding rate of return are equitably adjusted, and further provided that general business conditions remain reasonably stable. It has been necessary with the Boston gas rate to change the base repeatedly under the abnormal conditions prevailing in recent years.

The Dallas Electric Light and Power Company adopted a somewhat similar, although more comprehensive, franchise in 1917. In this case a base maximum rate of 8 cents per kilowatt-hour was established in connection with a 7 per cent rate of return. For each ½-cent decrease in the maximum rate, the rate of return is increased by one-half of 1 per cent until the rate per kilowatt-hour reaches 6 cents, below which, for each ½-cent further reduction, the rate of return is increased only one-fourth of 1 per cent. Increases or decreases in rate per kilowatt-hour are automatically determined, as in railway franchises, through the operations of a stabilizing reserve with defined upper and lower limits.

Limitations.—It is to be noted that the gas and electric franchises just referred to use the maximum rates as the basis of adjustment of return to investors. Such rates, particularly for electric companies, and in marked contrast to electric railways, are very different from the average rates because of the wide range in character of service furnished. Rates for wholesale power are always very much lower than retail rates. It is possible, within limits, to reduce maximum rates even below the cost of serving small customers without substantial reduction in the average rate by keeping commercial and industrial rates at a higher level than the cost of such service justifies. Such a procedure is undesirable, for it tends to remove from the public utility supply very large power business which can be taken care of from isolated plants, thereby restricting the spread of fixed and administrative cost and increasing the unit cost of all classes of service.

It is not practicable to substitute average rates per kilowatt-hour in place of maximum rates as the basis of adjustment of

return, as such rates depend very largely upon the volume of and rates applicable to wholesale service, and an intensive development of such service, even though the rates applicable thereto were not excessively low, would tend to reduce substantially the average rates without in any way affecting the retail rates. There are, therefore, definite limits to equitable applications of an incentive principle of the kind under discussion to electric and gas companies, and the solution of the problem remains for the future.

SUMMARY OF DESIRABLE FEATURES

The subject of franchises is so important that, before leaving it, it is desirable to summarize the evolution of thought and the recent tendencies by a brief statement of the principles which are now having support and acceptance in current negotiations:

1. All franchises, regardless of their form, should seek simplicity and elimination of details which are covered by jurisdiction conferred upon state public service commissions.

2. The terminable form should be adopted wherever permissible, and the passage of legislative acts authorizing such form should be encouraged.

3. Franchises should be exclusive wherever possible, through the requirement of a certificate of public convenience and necessity or otherwise, in the interests of both public and utilities.

4. Undue restrictions as to the character of service should be avoided, particularly with respect to railways. Such grants should authorize service "by electric cars or otherwise" so that bus service may be conducted by the railway companies in connection with rail transportation, to the extent that public desires or economic reasons justify.

5. No special taxes should be imposed upon public utilities, or paving or other miscellaneous charges, beyond those necessary to cover the actual costs incident to the service. Ordinary taxes on property should not be curtailed.

6. Free service should not be required except, possibly, transportation for uniformed members of police and fire departments, and payment should preferably be made for them by the city.

(The foregoing principles apply to all forms of franchises. Thosew hich follow have more special applications to service-at-cost forms.)

7. The fair value used as the basis of return and municipal purchase should be not less than the actual cash investment in the property, with reasonable allowance for intangible values where the business was not profitable in its early years and the losses have not been recovered.

8. Expenses should not be limited by allowances but should be the subject of annual budget limitations or careful supervision without budget.

9. Reasonable reserves should be provided for property retirement needs, preferably not with rigid uniformity but with both annual appropriations and the total accumulation adjusted within limits for consistency with the profitableness of the business.

10. There should be no amortization of investment other than intangible elements which may properly be written off in periods of prosperity and under reasonable rates.

11. Fare schedules, if prescribed in the franchise, should not contain fixed upper or lower limits, but should be subject to extension if required, and should preferably be subject to revision as to general character.

12. The fare-stabilizing reserve should be sufficiently large to avoid frequent fare changes, and should have some flexibility as to its upper and lower limits in connection with fare changes, so that temporary changes may be avoided.

13. There should be no cash distribution from surplus earnings to the city for general use or for the creation of an amortization or purchase fund.

14. The return to investors should not be definitely fixed but should have a flexibility which will stimulate efficiency and encourage improvements in operation. This feature is of especial importance.

15. Supervision should ordinarily be in the hands of a single person, preferably approved or appointed by the state utilities commission and functioning in close cooperation with this commission.

16. Municipal purchase should be authorized at suitable periods at the prevailing capital value, plus a moderate premium to cover losses to private owners and cost of liquidation.

17. Public contributions toward the cost of operation of unprofitable lines or abatement of rentals or other public charges should be authorized.

FRANCHISE VALUE

In conclusion, it should be emphasized that, under modern regulatory conditions, public utility franchises have no value. The value of business rights depends upon the ability to earn thereby a greater return on the investment than that which can be obtained elsewhere. In the early history of franchises, when there was no regulation or restriction upon profits other than through maximum rates which might be fixed therein, there were possibilities of profits beyond the returns from average business. These possibilities account for the capitalization of franchise values and trading therein which was not uncommon in the early days. Today the return which any regulated public utility may earn is fixed to correspond as closely as possible with that yielded in other kinds of business involving similar risks.

There is, therefore, no special incentive for capital to seek public utility investments and, because exceptional profits are not permitted, the franchise under which the business is carried on has no value. It is the almost universal present practice in rate cases to allow no franchise value in the rate base in excess of actual expenditures made to acquire the franchise. It follows that, aside from the formalities incident to the use of public streets and places which are within the jurisdiction of municipalities, a franchise today lacks the significance of former years and affords no equitable basis for taxation or other charges.

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CHAPTER IV

CAPITALIZATION

The capital requirements of public utilities are of greater relative importance than are those of other classes of undertakings. It has already been seen that the amount of public utility capital per dollar of revenue is greater than that in other business; also that the public utility business as a whole is growing more rapidly than any other comparable industry and, therefore, requires larger recurrent new investments. Under existing regulatory methods public utilities are not able to finance additions to their facilities through current revenues, as is the case to a large extent in other business. It is not unusual for large industrial enterprises to retain as surplus, in prosperous times, as much as 50 per cent of their profits without curtailing normal returns to their investors, using this 50 per cent to pay for the comparatively small routine additions to their plants.

SOURCES OF MONEY

The only margins which utilities under regulation withhold from distribution are the retirement provisions, other small equalizing reserves, and a similar surplus, ordinarily amounting altogether to not more than 15 per cent of the annual revenues, and even such reserves are available only temporarily for acquiring new property. The utilities must, therefore, go into the investment market for a very large part of their construction funds. A progressive utility may annually spend upon additions to its plant an amount in excess of 30 per cent of its revenues. It is estimated that the requirements for new construction and refinancing of the various groups of utilities, including railways, electric, gas, and communication companies, amount roughly to $1,500,000,000 a year, or $5,000,000 per working day. This is nearly one-third of the total surplus income of the United States available for capital purposes. Because of the size and constant increases of their capitalization, and the interest and dividend disbursements thereon, public utilities must give special attention to the character of the securities issued.

DISTINCTIVE FEATURES OF FINANCIAL STRUCTURE

Public utility securities do not differ in any essential respects from those of other corporations, and for the purposes of this discussion it will be assumed that the reader is familiar with the general character of corporate financing. There is, however, a noticeable difference between public utilities and other industries in the proportions of different classes of securities, in that the ratio of debt to equity is materially greater in the utilities. The average industrial capitalization includes only about 20 per cent of bonds, notes, and other obligations. Public utilities, on the other hand, may have from 50 up to possibly 75 per cent of their total capitalization in debt. An appreciable number of utilities have, however, adopted the policy of financing largely through stock issues with an insignificant amount of permanent debt.

The reason for this difference in financing policy between utilities and industrials lies in the more stable character of the utility business, which has already been pointed out. The greater the stability of the business the greater the proportion of capital which may be in the form of bonds without incurring the risk of default and foreclosure. There is, of course, a wide range in stability of industrial projects, and many of them can safely borrow in excess of the average percentage named above without incurring any greater risks of receivership than do public utilities, but the average fixed indebtedness of these industries is necessarily lower than that of public utilities for the reasons stated.

It is necessary, for public utilities, because of their rapid growth, to make liberal provision for expansion and flexibility in the financial structure. For this reason it is noticeable that authorized issues of public utility securities, particularly bonds of the older type, are very much larger than the current requirements at the time of authorization. Even with these liberal margins public utilities have frequently reached the limit of their mortgages and found reorganizations necessary in order to extend the limits of their borrowings. The more modern forms of bond issues, as will be seen, undertake to avoid this difficulty.

DISTRIBUTION OF CAPITAL BY CLASSES

The distribution of capitalization among different classes of securities will be considered more at length in the succeeding chapter dealing with these securities as investments. It is sufficient here to say that a typical public utility has indebtedness

amounting to from 50 to 60 per cent of the total capitalization, preferred stock amounting to from 15 to 20 per cent, and common stock amounting to from 20 to 35 per cent. The special characteristics of these different types of issues will now be briefly considered.

Bonds.—Because of expansion, reorganizations, and consolidations, the bonds of many large utilities show unusual complications ranging from first-mortgage bonds of underlying companies to consolidated, general and refunding, and otherwise designated issues of successor companies, the interrelations of which are sometimes difficult to trace. The earlier issues were all for fixed authorized amounts payable on a certain date.

Open-end Mortgage.—Some years ago it was found desirable to avoid the limitation upon the total issue under a given mortgage, and the so-called "open-end" mortgage was developed, under which the total amount of bonds, issued in various series, was not limited directly in dollars but restricted by other effective means. These included a limitation on the amount of bonds in relation to the total new capital requirements, the usual limit being 70 to 75 per cent. A further restriction had relation to the ability of the property to pay bond interest, the usual requirement being that the balance available for interest during the twelve months preceding a proposed issue must be at least one and three-fourths times the interest requirements on the outstanding and proposed issues.

Originally, the entire debt from time to time created under such mortgages became due on a certain date. More recently these mortgages have been given further elasticity by extending their duration indefinitely or to a very remote date, and permitting the issue of bonds without specified limits in successive series designated by "A," "B," "C," etc., maturing at various times and bearing such rates of interest as market conditions at the time of issue require, but retaining the restrictions above noted with respect to ratio of bonds to total capital requirements and of available income to interest requirements. Such bonds may also be used to refund earlier series and underlying issues. Bonds of this character are by no means restricted to public utilities, but they have been particularly helpful in solving the peculiar financing problems of such properties.

Depreciation Provisions.—Certain mortgages, in an effort to protect the bondholders against loss through deterioration in

the mortgaged property, have imposed upon the property certain minimum requirements as to expenditures for maintenance and accruals for depreciation or retirements. The percentage of gross earnings which must annually be spent or reserved for these purposes is commonly fixed between 12½ and 15 per cent. Bankers and trust companies who have had extended experience in handling such mortgages are coming to the conclusion that such restrictions do not afford the protection for which they were intended. Where these limits are fixed as a minimum they are apt to be interpreted as a maximum also, thereby operating unduly to restrict the provisions for upkeep of the property. An alternative plan under which the company covenants adequately to maintain its property and provide suitable reserves for retirements under the direction of an independent engineer selected by the trustee is believed to be more effective as a protecting measure and is now being gradually substituted for the older plan.

Sinking Funds.—The sinking-fund provisions of public utility bond issues are conventional, amounting to from 1 to 2 per cent annually of the bonds outstanding, with the alternative in some cases of using the funds, otherwise paid to the trustee for retiring bonds, to purchase mortgaged additions to the property without issue of bonds thereon. In either case the value of the property is increased in proportion to outstanding bonds. This increase may amount to something like 50 per cent for a long-term bond issue on well-maintained property. Contrary to opinions sometimes held, sinking funds are not intended to reduce the total capitalization of a utility, but merely to maintain or increase the bondholder's security. Junior securities may properly be issued on such property to the extent of sinking-fund accumulations.

Term.—Public utility bond issues of the fixed type, or the various series under the more modern mortgages, usually run from twenty to fifty years, a longer term than is found with industrial bonds. Public utilities do not often use the "serial" form of bonds, popular for government issues and some industrials, under which bonds are wholly retired uniformly during the life of the issue. Although in earlier years bonds were usually issued in $1,000 and $500 denominations, so-called "baby" bonds of $100 are now frequently found, their purpose being to encourage small investors to put their funds into public utilities. With tax-exempt bonds competing for the funds of investors subject

to high income tax rates, the "baby" bonds have been helpful in developing new sources of funds for necessary public utility construction.

Coupon Notes.—The other important form of obligation issued by public utilities is the coupon note, running from two to five or ten years, depending upon conditions of the utility and the money market. Such notes are not usually secured by mortgage, having only the general credit of the company as security. Public utilities other than railways do not make use of equipment trust certificates, through which railroads frequently finance their rolling stock purchases. Electric railways have made considerable use of this form of serial note to finance modern one-man cars, paying the notes through the savings in operation thereby effected. Public utilities have made little use of debentures, a form of obligation much used abroad and to some extent in American industrials. A few "debenture stocks" are encountered, this being another name for a prior preference stock.

Stock.—Although a few utilities use stock of a single class, known as capital stock, for all or a large part of their total financing, it is more common to divide the stock issue between preferred and common, the issue of the former being comparatively small in an effort to attract a class of investors who seek a higher yield than is obtainable from bonds but cannot assume the risks of loss of return or principal, or both, inherent in common stocks. Utility shares having a designated value formerly adopted $100 as a standard, but $50 and $25 are now becoming more common.

Preferred.—In addition to priorities as to dividends and to assets in liquidation, utilities have followed the common practice with preferred stocks in making the dividends cumulative; in fact, from 80 to 90 per cent of the recent offerings have been of that character. Public utilities have not ordinarily adopted some of the refinements elsewhere found respecting the voting and participation rights of preferred stock. The preferred usually has the same voting power as the common and does not share with the common in distribution of profits in excess of certain rates such as are sometimes found in other industries.

The voting rights of preferred may be omitted with respect to such matters as its own retirement but not on matters of general administration as is sometimes done with industrials where it may be exercised only during periods of dividend cur-

tailment or suspension. Recent years have witnessed certain subdivisions of preferred stock issues, an original issue being supplemented by a subsidiary or so-called "second preferred" having priority over outstanding common, or in some cases a so-called "prior-preference" stock is issued ahead of the original preferred, commonly carrying a higher rate of dividend and other preferences. Preferred stock is now being issued in some cases in series, similar to open-end mortgage bonds, the different series carrying, if appropriate, different dividend rates and redemption and other provisions consistent with the corporate charter.

Common.—Common stock of public utilities has no outstanding peculiarities. Because it is issued in larger amounts than preferred it can ordinarily determine the policy of the company, and can, if it sees fit, vote to retire the preferred stock and call outstanding bonds, concentrating the entire capitalization in the common stock. Bonds are commonly issued under the condition that they may be called as a whole or in part on any interest date at a premium, initially 5 per cent or more, the rate decreasing toward maturity. The premium at which preferred stock may be retired is usually between 10 and 15 per cent.

The laws of most states require that stock, either common or preferred, shall not be sold at a discount, although moderate allowances or deductions not exceeding 10 per cent to provide for brokerage and other expenses are commonly accepted as conforming to such requirements. In the early days of new properties and in periods of depression it is often not possible to sell stock at or near par. It is, of course, impossible to do the entire initial financing of a utility property through bonds, particularly when business prospects do not permit the sale of stock at reasonable prices. In order to undertake new developments for needed public service, it has, therefore, been necessary in the past to resort to certain expedients.

For new projects it was customary to employ a construction company to undertake the entire work, payment being made in securities of the utility instead of in cash, the directors of the utility certifying that these securities were reasonable compensation for the property and services received The construction company, in turn, sold the securities on the investment market, without legal restrictions, to reimburse itself for construction expenditures and profits of the undertaking. Where payment was made in bonds, and in preferred and common stock, conven-

tionally apportioned, it was not unusual for the construction company to receive in cash from the sale of these securities to investors an amount not exceeding the par value of bonds and preferred stock.

"BLOCK" SALES OF SECURITIES

The usual way of marketing such securities was to sell them in "blocks," including either a bond or ten shares of preferred combined with several shares of common, sold at a price not above the par value of the bond or the preferred. In such financing plans a portion of the common stock was frequently retained by the contractor and also by the investment bankers in payment for their risks in constructing the property or disposing of its securities and possibly also in partial payment for services. The par value of these stock holdings of the contractor and banker has often been of substantial amount. The real value of their holdings, however, was wholly contingent upon the success of the project. If full payment in cash had been demanded by the contractor or bankers, or both, for their services, it would not have been possible to finance many such projects because of the risks involved in finding a market for unknown and untried securities.

Bonus Stock.—It has often been contended that common stock, issued as described above, is nothing but "water," and even where this term has not been applied it has been customary to refer to common stock issued in blocks with bonds or preferred as "bonus." A clear analysis of the situation indicates that neither term is appropriate. The payment in stock to the contractor and bankers amounts to a contingent fee, the value of which depends upon the ultimate success of the property and its ability to pay. If the property succeeds and renders essential service to the public, and the original undertaking could not have been launched under any other plan of financing, a substantial value accrues to the public through the risks incurred in launching the project, which risk is represented by the common stock.

Construction Contracts.—It is not contended that all promotion and financing plans of the character here described that have been carried out in the past have been commendable. Some of them involved excessive profits, and in a few cases capital issues were carried to such an extreme as seriously to reflect not only upon the schemes involved but indirectly upon the

integrity of the many properly developed projects. Fortunately, with the development of the industry and under more comprehensive supervision, public utilities have become stable investments rather than speculative enterprises.

The profits above referred to frequently came through the formation of temporary construction companies, controlled by officers of a projected utility, through which the utility property was constructed and paid for in securities. An excessive proportion of these securities was retained by the construction companies for their services. Such of these securities as were in excess of proper construction fees were sometimes returned to the utility by the common officers of the two parties to the transaction and became "treasury" securities, to be sold later for new construction, thereby increasing the value of the property under its original capitalization.

Even if such practices were still continued, they would not now affect rates or service to the public, because, under regulation, capitalization is not a factor, rates being based on value in which reasonable cost is an element. There is a tendency to underestimate the value of necessary services in the promotion, organization, and financing of new utility projects, and the subject will be given further attention in the chapter on Valuation. The primary concern here is with the method of payment for such services. Payment should be proportional to value, and value is measured by the success of the project. It, therefore, appears, as already stated, that, in part at least, a contingent fee in junior securities, the value of which is particularly controlled by such success, is wholly appropriate and may be the only kind of fee which the project will support. Common shares without par value, which are later described herein, seem to be particularly suitable for this purpose.

With respect to the "bonus" stock sold to investors, it will be clear upon reflection that, if blocks containing ten shares of preferred and five shares of common are sold for $900, the preferred is not sold at 90 and the common given away, because the preferred alone would have no such market value before the project had begun to operate and demonstrate its soundness. A price of 80 would be high for such preferred, and so the common actually sells at not less than $20 per share. In a block containing a $1,000 bond and five shares of common selling at $1,000, the common has a similar value, for such bonds would not ordinarily

sell above $900. The whole proceeding is a means of getting the common stock into the hands of investors at what it is really worth, which is by no means negligible if the prospects of ultimate success are favorable. If the project had no such prospects, it would rarely have been undertaken.

COMMON STOCK REPRESENTING GOING VALUE

The early years of public utility operation always show meager returns, profits are insufficient for dividends, and the margin over bond interest for retirements and contingencies is small. A careful study of the financial history of many typical public utilities shows that a period of five to ten years usually elapses before operations become really remunerative. In the meantime investors have sacrificed their return upon the equity in the property and the only practicable way of recovering their early losses is through appreciation in value of, or ultimate dividends upon, their common stock holdings.

The studies of actual history referred to show a surprising number of cases in which the deficiencies in return in early years have amounted to approximately the par value of the outstanding common stock. The issue of this stock may, therefore, be considered as advance capitalization of the early losses or as representing going value, which is commonly recognized as a proper part of the value of utility property for rate-making purposes, although with limitations to be considered in the chapter on Valuation.

NO-PAR-VALUE STOCK

The difficulties of financing through stock with the legal restrictions upon the price at which it may be sold have always occasioned embarrassment and have led to procedures which, in spite of their legality, have occasioned annoyance and expense. Such procedures are now avoidable in many states through the use of shares having no designated par value. Such shares represent merely a proportional ownership in the property and rights to its earnings. It is by merest accident that the real value of a share of stock equals the value indicated on the older form of certificate, and such equality rarely continues for any length of time. The no-par-value stock carefully avoids any such indication of its value and is, therefore, not misleading. It

also avoids any question of assessments in connection with stock which was not originally sold at par. Because such stock may be sold at any price which the market will support, it facilitates financing through junior securities, particularly in the early stages of operations above referred to.

The use of no-par-value stock in the United States was recommended in 1911 in a report to Congress by the Railroad Securities Commission, and it was first authorized in New York in 1912, although it was employed some years earlier in European countries. Such issues are now permitted, as far as common stock is concerned, in about three-fourths of the states of this country, and preferred shares without par value may be issued in about half the states. Not all these states, however, permit public utilities to issue shares of this character, the special laws under which they operate differing in this and other respects from general corporation laws.

An analysis of the issues of industrial shares in the six-year period ending in 1921 shows that nearly 50 per cent were of the no-par type. Some public utility authorities, while approving no-par-value common stock, have questioned the advisability of similar preferred in view of the necessity of indicating the preference in dividends and in liquidation. Although such indications of priority are necessary, it, nevertheless, not infrequently happens that financing with preferred stock is quite desirable at a price so much below a designated par value as to be inconsistent with legal requirements. Specific disadvantages arising from preferred stock without designated par value have not been seriously urged, and it is to be expected that its use will increase.

Certain accounting complications exist in connection with no-par-value stock, particularly with respect to the balance sheet, and no uniform solution has yet been reached. Under consistent no-par-value accounting the property account in the balance sheet would more accurately represent the cash investment therein than accounting for par-value capital, where it is usually set up to balance the outstanding securities. Many such balance sheets combine in the surplus account the common stockholders' equity, represented by their payment for their stock and the undistributed profits accumulated from the business. There are advantages in having the earned surplus separate from other items as an indication of the prosperity of the company.

FACTORS AFFECTING CLASSES OF SECURITIES TO BE ISSUED

Before concluding this discussion of capitalization it will be of interest to summarize the factors which determine the character of the securities that a public utility may issue from time to time. It should be the general aim of the utilities as far as possible to meet the demands of the investment market for securities of a wide range of yield and stability. The more the appeal for utility securities can be broadened, the lower will be the average cost of new money.

Aside from such appeal to investment market conditions, various other factors affecting the utility's own business must have consideration. They include the amount of each class of security already outstanding, money rates, the current profitableness of the utility's business, the terms of its franchises, the degree of maturity of the enterprise, and, sometimes, the use of the proceeds from the sale, whether for new, profitable business or for such unremunerative construction as paving.

When to Issue Bonds.—Applying these principles more specifically to the various classes of securities, it appears that bonds may be sold when the existing issue does not materially exceed 60 per cent or thereabouts of the total capital, when money rates are above normal, when the business of the utility is not particularly prosperous and junior securities would sell at excessive yields, and when the general long-range movement of prices is upward. The last-named factor is considered solely from the selling point of view. The buyer's interest would be toward bond investments when the general trend of prices is downward so that the dollars he receives at maturity will have a greater purchasing power than those invested. If, however, both buyer and seller have the same appreciation of the significance of price trends, and the bond yield is adjusted accordingly, the importance of this factor tends to disappear.

When a project is first started, it is customary to sell bonds as far as possible within limits which assure that interest requirements will be regularly met. Where bonds are sold at high yields during periods of high money costs, they may be called under more favorable market conditions and replaced by junior securities or lower rate obligations, whereas if common stock were sold under such conditions it could not be retired.

When to Issue Stock.—Preferred stock is commonly issued when the business has become more stable and when general

money rates are reasonable. Common stock is issued when the company is prosperous, when general money rates are low, and when the general trend of prices is downward. Coupon notes are resorted to in times of business depression and high money rates. In the years 1918 to 1920 coupon notes made up 46 per cent of the total public utility financing as compared with 16 per cent in a period of years before the war. Bank borrowings on short-time notes are negotiated in times of extreme money stringency and at other times recurrently between permanent financings.

APPEAL TO VARIOUS CLASSES OF INVESTORS

The various classes of securities referred to herein serve to take care of capital requirements of public utilities in the various stages of their own development and prosperity and under widely varying general business conditions. They also serve the further important purpose of reaching a wide range of investors, actual and potential. The constant need of new capital is so great, and the competition for it so keen, that public utilities must make an effective appeal to all classes of investors. These investors include savings banks, which require exceptional security and are controlled in their investments by laws referred to in another chapter; trustees, who also require a high degree of safety and stability; and a wide range of individual investors, including, on the one hand, those whose primary requirement is safety, and, on the other hand, those who can afford material risk of both principal and return if the possibilities of high average return are favorable.

These varying requirements are met by bonds, underlying or subsequent issues, with substantial variations in security; preferred stocks with somewhat greater risk of principal but stability of return; and common stocks, representing maximum possible return but with correspondingly increased risks. Savings and other banks have public utility investments amounting to about $2,000,000,000, and life insurance companies have likewise invested a similar amount from the funds which they have accumulated from 80,000,000 policies. Individual and other corporate investors to the number of more than 2,000,000, of which one-half are customers or employees of public utilities, have furnished the balance of the $17,000,000,000 of capitalization under which public utilities operate.

The above brief discussion and references, together with a consideration of the characteristics of utility securities as investments, to which Chap. XII is devoted, will serve as an outline of financing and investment procedure. For further information regarding general corporation financing methods the books listed below will be found helpful.

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CHAPTER V

ACCOUNTING METHODS

Although the life of the public utility industry may be roughly set down as forty years, it is only within the last year or two that uniformity of accounting methods has been obtained. In the earliest years of the industry lack of uniformity was not surprising because there was no standardization in any accounting practice.

EARLY HISTORY

Probably the first attempt at standardization was that of the Massachusetts Railroad Commission, which in 1876 prescribed certain accounting methods to be followed by steam railroads in Massachusetts. The system then put into effect was far from complete. About twenty-five years ago a group of public utilities under common management put into effect a complete standard system of accounts for railway and electric properties in order that their operations might be more readily analyzed and compared. This was probably the first extended use of standardized accounting by public utilities. The first complete prescribed systems of accounts for public utilities were developed in 1907 by the commissions in the states of Wisconsin and New York, and they were later used as models by other states. The Massachusetts commissions had previously developed partial standardization applicable to prescribed annual reports but lacking the detailed instructions and supervision of later systems. In 1908 the Interstate Commerce Commission established a complete system of accounts for interstate electric carriers, patterned after steam railroad accounting methods, the standardization of which had been undertaken two years before. A revision of the Interstate electric railway classification of accounts made in 1914 is still in effect, although certain further revisions are now under consideration. This Interstate classification is in no way binding upon state commissions and does not necessarily apply to intrastate carriers, but it has been adopted in substance by most of the state commissions for the railways under their jurisdiction.

DIVERSITY IN PRESCRIBED SYSTEMS

No such Federal authority exists over electric, gas, or other local utilities, and so standardization of their accounting was not brought about by such precedents. In fact, each state commission prescribed its own system for these utilities, some differing slightly and others radically from methods previously in effect. The result was not only confusing but in some cases involved embarrassments and conflicts. Utilities operating in two or more states, having different accounting systems, might be required to keep in each state not only the local books dealing with the business in that state but general books covering the entire business of the utility according to the particular methods prescribed by that state. In other cases distinct companies under common ownership or management were embarrassed by the necessity of keeping different systems of accounts, which made accurate comparisons of their operations difficult if not impossible without extensive reclassifications.

NEW NATIONAL STANDARD

The various state commissions having jurisdiction over utility accounting (about thirty-eight in number) were not in ignorance of the confusion and embarrassment resulting from their diverse accounting methods, and in 1919 the National Association of Railway and Utilities Commissioners appointed a special committee to collaborate with similar committees of the National Electric Light Association and the American Gas Association in the formulation of uniform systems of accounts for these two classes of utilities. After several years' study of the accounting systems of the various state commissions and accounting principles which have been adopted in general corporate practice, the Association of Commissioners in November, 1922, approved uniform systems of accounts for electric and for gas utilities and recommended their adoption by the state commissions. These two systems were identical in their fundamentals, differing only in such details as the characteristics of the business made necessary. Within two years twenty-two state commissions had adopted these uniform systems and fifteen other states had their adoption under consideration. Only one state commission (California) has since adopted a different system, that prescribed by the Federal Power Commission for electric power company

licensees of government water powers, such powers being particularly important in California.

SPECIAL FEATURES OF UTILITY ACCOUNTING

It is not within the scope of this book to discuss accounting principles and details. Such information as the uninformed reader wishes on this subject may be found in the various treatises and handbooks on corporate accounting and the several pamphlets issued by regulatory bodies containing the accounting systems prescribed for public utilities and instructions for their use. It will, however, be appropriate to point out some of the special features of public utility accounting and certain inconsistencies still existing in the methods prescribed for different classes of utilities.

Public utility accounting has a broader usefulness than that of most other corporations. It serves to set forth the financial results, current and cumulative, of the operations of these utilities for the information not only of executives, bankers, investors, and the general public, but also taxing authorities and regulatory commissions. It is necessary that the commissions have accurate and uniform reports of the operations of public utilities under their jurisdiction in order that they may be compared and the cost of service determined and rates adjusted accordingly. The interest of the general public in the financial statements of public utilities is comparatively new, and the present readiness of public utilities to publish their financial statements is in marked contrast to the policies in effect in earlier years.

Financial Summaries.—The financial showing of public utilities is commonly summarized in two forms of financial statements, one, a so-called income statement setting forth the operations of a particular period, usually twelve months; the other, the balance sheet, which reflects the cumulative operations up to a certain date.

Income statements are summaries of detailed classifications of revenues, expenses, taxes, and other charges. Maximum importance naturally attaches to operating revenues and expenses, which include the major complex operations of public utilities. The main purpose of subdivisions of revenues and expenses, particularly the latter, is to indicate clearly the character and extent of increases or decreases as compared with previous similar periods.

Expense Analysis.—A study of the expense accounts contained in the various standard classifications shows that expenditures have been divided, as far as the character of operations permits, into quite small groups so that divisible expenditures represented by any single expense account will ordinarily contain less than 5 per cent of total operating expenses. A quite large percentage variation in any single expense account, therefore, represents a very small percentage of the total expenses which the responsible executive seeks to control. It is not possible to make similar subdivisions of revenue accounts because of the comparatively few classes into which service is divided. It is, therefore, impossible to avoid having quite large percentages of the operating revenues in one account, possibly far in excess of 50 per cent unless geographical or other special subsidiary accounts are employed.

Bases of Classification.—It may be of interest to note certain fundamental differences in expense classifications of different groups of utilities. The new uniform electric and gas classifications provide primarily for a functional classification, *i.e.*, production, distribution, administration, and other expenses are in separate groups, and each group is subdivided into numerous expense accounts with, however, a primary subdivision between operation and maintenance. It is, therefore, a simple matter to determine the total maintenance expenditures as distinct from expenses of operation by adding the several subgroups of maintenance accounts.

For electric railways the primary grouping of accounts is among maintenance, operation, and administration. Maintenance and operation groups are appropriately subdivided along functional lines. Such, at least, was the original scheme of railway accounting. The 1914 revision, however, introduced a new group of power accounts in which operation and maintenance are not definitely separated. It is, therefore, not now so easy as before to segregate operation from maintenance.

ACCOUNTING FOR DEPRECIATION

There is another noteworthy difference between the accounting practice of electric and gas utilities as developed by the state commissions and that for electric railways initiated by the Interstate Commerce Commission. This difference lies in the treatment of depreciation or retirements. Gas and electric

classifications provide a single expense account in the general expense group which may be used as the channel through which reserves for retirements are accumulated regularly or otherwise, but direct appropriations from surplus may be substituted wholly or in part for retirement expense charges to create the retirement reserve.

Interstate Method.—The Interstate electric railway expense classification, on the other hand, contains a depreciation account in each maintenance group, intended as the source of a uniform accumulation of depreciation funds based upon estimated useful lives of property in the several groups. The depreciation account in the equipment group is the only compulsory one at this time, the use of the others being optional with the carriers.

Experienced accountants do not wholly approve the Interstate practice because they do not like to mix estimates with facts. They prefer to include only facts in operating expense accounts, reserving estimates and intermittent or fluctuating appropriations for the profit and loss account, which provides for many such charges. It may be contended that the accounting principle of not mixing facts and estimates has not been consistently carried out in other accounting methods now in effect, since certain costs, such as accidents, which may fluctuate widely from time to time are taken care of by estimated accruals that are made as nearly uniform as possible. While such estimated charges are made, it is, nevertheless, true that, in general, the accruals and the costs are brought into adjustment at the end of each year or other comparatively short fiscal period, and that it is possible to estimate such costs much more accurately than retirement costs covering much longer periods.

The Interstate Commerce Commission accounting methods for depreciation were developed prior to those of most of the state commissions and have been followed in substance by the Federal Power Commission, interstate telephone properties, and the Internal Revenue Bureau. Nevertheless, the exhaustive consideration given to this subject during several years by the accountants and engineers of the state commissions, and the more intimate knowledge which these commissions have of the practical operating problems of local public utilities, afford ground for the opinion that the flexible program which the state commissions have embodied in their uniform accounts is more appropriate than that of the Interstate Commerce Commission.

Few of the state commissions which have authorized the use of the Interstate accounting system for electric railways have definitely included the Interstate depreciation accounts in their requirements.

Purposes of Depreciation Accounts.—Because of the fundamental character of this difference in accounting practice and because it is the one remaining important controversial point, it is desirable to make a more detailed study of it to supplement the broader discussion of the subject from the legal or regulatory viewpoint contained in Chap. VIII. It is the well-established duty of public utilities to maintain their properties in serviceable condition and to collect from their patrons sufficient revenues to provide for repairs of property elements during their useful lives, and for their retirement when these lives are ended. It is generally agreed that "retirement" involves the removal of the elements from the fixed capital account at their original cost, estimated if not known, with a concurrent charge to retirement reserve of this cost plus the cost of removal less salvage. Retirement of property units is due to various causes, the most important of which are (1) obsolescence, occasioned by new inventions, discoveries, and improvements in engineering methods; (2) inadequacy resulting from business expansion and the need of larger units; (3) supersession, arising from change in public habits and demands and legislative or other acts; and (4) decrepitude, brought about by use and the action of the elements.

Impossibility of Accurate Forecasts.—Experience with public utility property has shown that comparatively few important units are retired because they wear out. Small units, such as poles and fittings, ties, rail and special track work, wire, etc., are commonly renewed for this reason, although paving construction and other street changes, and required substitution of underground distribution for overhead lines, frequently cause removal of even these items long before their normal life is ended. The routine replacement of small units is regularly handled through maintenance accounts without the use of a retirement reserve. It is also the common practice of large companies to handle replacement of property units of substantial size in a similar way if this is possible without distortion or departure from reasonable uniformity of maintenance charges. Such practice is facilitated when the time of replacement is subject to control, as is commonly the case within quite wide limits.

Even small properties may sometimes charge substantial retirements to maintenance, thus demonstrating the interrelation of maintenance and retirement accounts and the general need of studying them together rather than separately. The extent of replacements charged to maintenance depends largely upon the size and character of the property, and many very large systems have found that no substantial reserves are necessary for the purpose of stabilizing maintenance charges, at least so far as retirements due to decrepitude and kindred causes are concerned The term "physical depreciation" is sometimes applied to that due to these causes, as distinct from "functional depreciation" due to obsolescence, inadequacy, and supersession.

The year-to-year requirements to take care of physical depreciation, whether provided through current maintenance expenditures or appropriations to a reserve, can be estimated with reasonable accuracy. To a lesser extent, depending upon the growth in population and industrial activity of the territory served, inadequacy may also be predetermined. On the other hand, the other forms of functional depreciation cannot be forecast with any approach to accuracy. The history of public utility property shows many cases of equipment continuing in service for twice its conventional life expectancy and other cases of units retired before one-fourth of such life had elapsed, although wholly modern and up-to-date when acquired. While future engineering and economic developments may not be as revolutionary as those in past public utility history, there is no assurance that this will be the case, and there are possibilities, although not clear indications, of further radical changes. The introduction a few years ago of one-man cars of a distinctly new type and their rapidly expanding subsequent use illustrate the possibile effect of wholly unforeseen developments.

In spite of this situation, depreciation literature abounds with so-called life tables of the various units and structures which make up public utility property. These tables have had far more attention than they deserve, partly because, through publication and republication, they have lost their original significance, which in most cases had application only to some particular property or conditions. Discriminating authors who have reproduced such tables have attached to them an explanation of their limitations and a warning against their general use.[1]

[1] Gillette and Dana, "Mechanical and Electrical Cost Data," p. 104.

A. E. R. A. Investigation.—Conscientious efforts have been made to compile life tables of some value. One such notable effort was made in 1913 by a special committee of the American Electric Railway Accountants Association. This committee, after wisely associating with itself a group of engineers from an allied association, undertook to assemble from the railway members of the Association helpful data on the useful life of electric railway property elements. The response from the executives of these companies was so uniformly to the effect that the proposed life tables would not only be useless but might also be dangerous that the plan to compile and publish such tables was abandoned, as indicated by the following extracts from the report of the committee to the Association:[1]

> This Committee during the past two years has consistently endeavored to secure from qualified representatives of member companies of these Associations and others, figures expressing in years the length of life of the elements of railway physical property. Two inquiry forms have been sent out and personal solicitations for careful consideration and answers made . . .
>
> An examination of replies received shows a wide divergence of opinion as expressed in figures among those qualified to judge by actual experience and training. Those having had practical experience, for the most part felt that any attempt to express at present the life of railway property explicitly, in years, was at best a guess.
>
> All this goes to emphasize the conclusions of the Committee that life of railway physical property cannot at present be expressed in any tables measuring the life either in years or units of use; that where such are attempted, they are merely estimates and often no better than guesses.

During the investigations of this committee a half dozen engineers and operators of railway properties connected with a certain organization, all of long and wide experience, were requested to prepare estimates in accordance with the wishes of the committee. Their problem was simplified by the exclusion of the effects upon useful life of functional depreciation and all abnormal climatic and operating conditions. The estimates of these six men were so divergent that the men were assembled for the purpose of harmonizing their views. They declined to compromise the results of their varied experience, and agreed that such a compromise would represent no actual general experience, other than by improbable coincidence. The divergence of the estimates here referred to are shown in Table VI.

[1] *Proc. Amer. Elec. Ry. Acc. Assn.*, 1913, p. 210.

TABLE VI.—DIVERGENT ESTIMATES OF OPERATING LIFE OF ELECTRIC RAILWAY PROPERTY

	Useful life (years)		
	Minimum	Maximum	Average
Building and structures:			
Buildings (frame)	20	40	26.7
Buildings (mill construction)	40	100	60.8
Buildings (fireproof)	60	100	90
Dam (wood, earth)	15	50	31.7
Flume (masonry)	50	100	75
Flume (wood)	5	20	13.3
Conduit for wire (terra cotta)	40	100	70
Bridge (steel)	20	60	45.6
Trestle (yellow pine, untreated)	10	20	12
Equipment:			
Car bodies	15	20	17
Control equipment	12	20	14.7
Air-brake equipment	10	15	14
Motors	10	15	12.9
Trucks	10	20	13.9
Miscellaneous shop tools	10	20	17
Power distribution:			
Trolley wire	1	20	15
Feeder (W.P. insulated)	15	20	18.3
Cable (lead-covered)	20	30	25
Poles (iron)	15	50	24.2
Poles (wood)	7	20	12.5
Line material	10	50	26.7
Power Generation:			
Water wheels	20	50	28.8
Engine (steam)	10	50	26.3
Turbines	20	25	21
Boilers	5	20	14.2
Condensing system	15	20	18.8
Piping system	5	25	19.2
Generator	15	25	21.3
Convertors	15	25	21.7
Transformers	20	30	25.8
Switchboard apparatus	20	30	24
Coal-handling machinery	5	20	13
Track (track in paved streets assuming 7½ minutes' headway with 5 minutes' headway in rush hours, 30-tons double-track cars):			
Rail	12	15	13
Joints	5	20	11.2
Ties (untreated)	9	15	11.6
Bonds	6	20	10.5
Hardened-center special work	7	20	13.5

This table is reproduced with reluctance lest it be considered a life table or useful as such. It is intended merely to demonstrate the impossibility of accurately estimating useful life for applicability to public utility property generally. Each property

has its own climatic, political, economic, and other conditions affecting the usefulness of its elements, and these conditions are by no means fixed or even stable.

The Fundamental Question.—Granting the substantial accuracy of the above view of useful lives—and few experienced utility operators have questioned it—the accounting question involving depreciation resolves itself into this: Can a fundamentally indefinite requirement be met by mathematically exact accounting procedure? The question would seem to have an obvious answer; but, in spite of such answer, several state commissions, prior to the adoption of uniform accounting methods, required fixed depreciation charges based on estimated useful lives, sometimes on the sinking-fund basis with exacting restrictions upon the investment of the accumulated depreciation funds.

The Interstate Commerce Commission has not only advocated such methods but is seeking to extend their applicability. The Commission's depreciation accounting staff has drafted a plan under which all important carrier property is divided into classes with depreciation rates for each based upon useful lives of the similar items contained therein. If any group of items outlives its estimated usefulness, accruals cease when the cost has been accumulated, but if a group fails to survive until accruals are adequate, the deficiency is made up, not from liberal reserves created for other groups, but by special appropriations from surplus or charges to regular maintenance accounts. Even the propriety of charging cost of removal of retired property to the accumulated reserve is questioned in this Interstate plan.

Uniform System Provisions.—In marked contrast to this proposal are the provisions of uniform electric and gas classifications. The text of the instructions covering the retirement reserve is as follows:

To this account shall be credited such amounts as are charged to Operating Expense Account "Retirement Expense," appropriated from surplus, or both, to cover the retirement loss represented by the excess of the original cost, plus cost of dismantling, over the salvage value of fixed capital retired from service. When any fixed capital is retired from service, the original cost thereof (estimated if not known, and where estimated, the facts on which the estimate is based should be stated in the entry) should be credited to the proper fixed capital account and charged, plus the cost of retirement, less salvage, to this account. If the credit balance in this account is insufficient to cover the retirement loss, the excess over the balance contained

in the reserve should be charged to account No. 132, "Property Abandoned," which see, or other appropriate account.

The losses which this account is intended to cover are those incident to important retirements of buildings, of large sections of continuous structures, like electric line, or of definitely identifiable units of plant or equipment, and the purpose of the account is that the burden of such losses may be as nearly as is practicable equalized from year to year, but with due regard for amount of earnings available for this purpose in each year.

The text of the retirement expense account is as follows:

This account shall include such amounts, in addition to appropriations from surplus to retirement reserve, as the accounting company may determine to be necessary to provide a reserve against which may be charged the original cost of all property retired from service plus the cost of dismantling, less salvage. The amounts charged to this account, or appropriated from surplus, and credited to the "Retirement Reserve" shall be in addition to the necessary costs of keeping the plant and equipment in a high state of efficiency through charges to the regular maintenance accounts

Note: It is the intent of the classification that a reserve shall be provided either through retirement expense or by appropriations from surplus or both, sufficient to cover all retirement losses that may reasonably be expected.

It is to be noted that the word "depreciation" does not appear in this text; nor is it to be found in any other part of either the electric or the gas classifications. The "Property Abandoned" account, referred to in the quoted text, is a suspense account through which deficiencies in retirement reserve may be made up by future amortization. The entire reserve is available for any retirement, with no such division into restricted classes as Interstate methods require. Each utility, based on its experience, profitableness, and the judgment of its responsible agents, makes such provision for retirements as it considers necessary, and decides whether the credits to retirement reserve shall come from expense or surplus or both.

Possible Distributions of Upkeep Costs.—There are, thus, three ways in this system through which the entire upkeep of the property is provided, namely, maintenance accounts, retirement expense accounts, and surplus. The apportionment of upkeep costs among these three sources is not wholly defined in the uniform classifications. Routine repairs must be charged to maintenance, but larger replacements may within limits be handled differently on properties of different sizes. The replacement of a certain element might be a routine one on a large property and be charged to maintenance, but on a small property it would be so large as unduly to distort maintenance totals, and would,

therefore, be taken care of through retirement reserve. In the brief time during which the uniform systems have been effective no standard practice of dividing retirement reserve accruals between expense and surplus has been developed. Logically, the expense accruals should be limited to those which can be made accurately and with regularity, such as provisions for important retirements due to physical causes and, possibly, such inadequacy or supersession as can be clearly foreseen. Retirements due to any functional causes which cannot be estimated with accuracy should be provided for through appropriations from surplus which may properly and perhaps necessarily lack regularity and involve no undesirable fluctuations in income statements. There is no obligation to use the retirement expense account, and, where non-uniform accruals to the reserve are made from surplus, expense charges may be omitted for simplicity, if for no other reason.

Flexibility in Retirement Accruals.—The executives of a utility may, in the exercise of broad business judgment, estimate that a certain important retirement will be required twenty years hence for reasons now unknown. They realize, however, that the retirement may be necessary in fifteen years, or may be postponed until thirty years, and that in the meantime there will be recurring years of prosperity and depression. They see no reason why they should at once begin, and thereafter continue, a fixed accrual, regardless of business conditions, which would accumulate the cost of this property in twenty years, when, with other like accruals required for the balance of the property, dividends would necessarily be curtailed or stopped in unfavorable years, with margins well in excess of normal dividend requirements in other, prosperous years.

Investors are not unlike laborers in seeking regularity of income, and they prefer dividends at a certain regular rate to fluctuating dividends at a higher average rate. A uniform 7 per cent dividend, for example, would be preferred to a variable rate ranging from 5 to 10 and averaging 7½ per cent. Stability of return to public utility investors, therefore, means lower cost of service and lower rates to patrons. To the extent that such stability can be maintained without endangering the efficiency or continuity of service or the security of the investment in the property, it is desirable from every point of view. The flexibility in retirement appropriations, which is provided in electric and gas

accounting, is a step in this direction, and further tends to remove utilities from the speculative class of enterprises. Furthermore, a single reserve for retirements instead of a multiplicity of separate reserves for different classes of property not only involves simpler and less expensive accounting but also has the advantage of a greater and better-balanced protection of property with a given total reserve.

Retirements from Obsolescence.—One other factor in the problem of retirement accounting needs attention. It has been stated that a large proportion of public utility retirements is due to obsolescence or other functional causes. Among these is the substitution of more efficient machines and safer cars and other equipment—all resulting in lower cost or better service to those who use the new facilities but of no advantage to the users of the older equipment. The question arises as to why the users of the old equipment should pay higher rates to retire it in a comparatively few years in order that future patrons may enjoy the advantages of better and safer service at lower costs.

Utility executives do not freely spend money for more modern and efficient equipment unless the savings from its operation will at least pay the carrying charges on the cost, and usually the margin is sufficient to permit the amortization of that part of the investment in the old equipment not already provided for in the existing retirement reserve. With no increases in rates and possibilities of reductions, the users of such new facilities may properly continue the burden of amortization of superseded property, and the "Property Abandoned" account above referred to is provided for this purpose. The United States Supreme Court has given consideration to this question and decided it in conformity with the views here expressed. A recent case is particularly illuminating, as shown in the following quotation:

> The obsolescence in question did not result from ordinary use and wear. Certainly it could not have been long anticipated—the patents were of recent conception; to provide for it out of previous revenues was not imperative, if possible. Former consumers were not beneficiaries; only subsequent ones could be advantaged.[1]

The foregoing discussion of depreciation from an accounting point of view has not tended to clarify the accountant's problems. It appears that "depreciation" is too indefinite and confusing a

word to have a place in modern accounting, and that "retirements," which takes the place of depreciation, should not be provided for in the precise, mathematical manner to which accountants are regularly accustomed. It is not surprising that accountants should still favor the more definite but less accurate methods, the responsibility for which rests largely with them. To add to the accountant's confusion, it appears that, while some retirements are to be provided for by more or less irregular accruals in advance, others may be neglected, in part at least, until after they have happened, and then amortized, possibly in a similarly indefinite manner.

Accountant's Responsibility Limited.—It will simplify the accountant's problem if he will realize that the accumulation of a suitable retirement reserve is a matter of executive rather than accounting responsibility. Accountants are not directly responsible for dividend or other appropriations from surplus, many of which are irregular, other than carefully to prepare the necessary statements showing the amounts which may properly be appropriated, and to make correct entries covering such appropriations upon the receipt of authoritative instructions. They should similarly view annual or other appropriations from surplus to retirement reserve as requiring the careful attention of executives in the light not only of the accountants' financial statements but also of present and future business conditions, extent of accumulated reserves and of unappropriated surplus, the physical condition of the property, and other matters with which accountants cannot be wholly familiar. The factors which should influence the executives in their appropriations are dealt with more fully in the chapter on Depreciation.

Present Confusion.—Until the adoption, now in progress, of the uniform electric and gas accounting systems has been made complete, and so long as present requirements of the Interstate Commerce Commission and Federal Power Commission and the Internal Revenue Bureau continue in effect, there will be confusion and inconsistency in retirement accounting. It is to be hoped that this inconsistency will be settled in the near future to avoid, among other things, ambiguities now existing in income statements, published in annual reports, periodicals, and financial advertising. When one such statement includes full provision for depreciation in operating expenses, and another provides for all retirements from surplus without full explanation of the

existing practice, the result is confusing or misleading. Assuming that retirement provisions may properly lack uniformity, the need of excluding them from condensed income statements is apparent, if fluctuations disturbing to uninformed investors and others are to be avoided.

STANDARDIZED METHODS OF CLASSIFICATION

It is now in order further to review the scope and general plan of subdivisions of the various groups of accounts. The picture presented is to some extent a composite of the different standard systems which do not wholly agree as to methods and details. With few exceptions, however, it appears that fundamental principles have been consistently recognized.

Revenues.—Modern accounting provides for a separation of revenues into two general classes: (1) "operating revenues," derived from the regular operation by the utility of its owned or leased property in public service; and (2) "non-operating revenues," derived from rentals, income from investments, and other miscellaneous receipts from property not owned, or owned but not operated. In a public utility, the rates of which are under consideration, such segregation of revenues, together with a similar segregation of property, makes it possible more readily to determine the adequacy of existing rates without consideration of other property and operations.

Operating revenues are usually divided into two groups: (1) those which come directly from the service or commodity in which the utility primarily deals; and (2) those from allied or subsidiary operations, such as advertising and other concessions, jobbing and appliance business—all conducted on or in connection with the operated property. The first group of operating revenues is further classified according to kinds of business, such as residence lighting, commercial lighting, power, sales to other utilities, street lighting, etc., with electric utilities. Some companies find it convenient further to classify their revenues according to the rate schedules from which the revenues are derived. Such classification permits a more ready analysis of the effect of any proposed rate changes.

Expenses.—Classifications of operating expenses in the standard systems differ in one respect from those employed for revenue and other purposes in that they are graded to meet the needs of different sizes of properties so that small properties will

not be burdened with unnecessary refinements. The grading is based on annual operating revenues. For electric and gas utilities the full detailed classification is used only by properties which have such revenues in excess of $250,000. A somewhat condensed system is used for revenues between $50,000 and $250,-000, a further condensation between $10,000 and $50,000, and a still simpler system where the revenues are less than $10,000 per annum. These several classes of properties are called "A," "B," "C," and "D," respectively. Electric railways are similarly

Table VII.—Summary of Electric Operating Expense Accounts Showing Number of Accounts Used by Different Classes of Utilities

	A	*B*	*C*	*D*
Steam-power generation:				
Operation	12	6	6	4
Maintenance	11	4	4	1
Hydroelectric generation:				
Operation	8	3	3	2
Maintenance	15	4	4	1
Gas generation:				
Operation	11	4	4	3
Maintenance	8	4	4	1
Miscellaneous production	3	3	3	3
Transmission:[1]				1
Operation	8	4	4	
Maintenance	7	5	5	
Distribution:[1]				1
Operation	15	5	5	
Maintenance	10	7	7	
Utilization:				1
Operation	8	3	3	
Maintenance	3	2	2	
Commercial	7	5	2	2
New business	7	2	1	1
General and miscellaneous:				
Operation	25	19	10	9
Maintenance and retirement	3	3	1	1
Total of all accounts	161	83	68	31

[1] These groups may be combined where the physical properties are so intimately associated that accurate segregation is impracticable. Operation and maintenance combined in class D.

grouped into three classes with revenues in excess of $1,000,000, $250,000 to $1,000,000, and less than $250,000, respectively.

It may be of interest to present, as an illustration of such accounting procedure, an outline of the uniform electric expense classification, including the main groups and subgroups of accounts and the numbers of accounts in each, which are used by the several classes of properties. This illustration is supplemented by the full classification of steam power generation expenses for class A companies. (See Tables VII and VIII.)

TABLE VIII.—DETAILS OF STEAM-POWER GENERATION EXPENSE

Acct. No.	
701.1	Superintendence
701.2	Boiler Labor
701.3	Engine Labor
701.4	Electrical Labor
701.5	Miscellaneous Labor
702.1	Fuel
702.2	Water
702.31	Lubricants
702.32	Production Supplies
702.33	Station Expense
703.1	Maintenance of Station Buildings
703.21	Maintenance of Furnaces and Boilers
703.22	Maintenance of Boiler Apparatus
703.23	Maintenance of Steam Accessories
703.24	Maintenance of Steam Engines
703.25	Maintenance of Turbogenerator units
703.31	Maintenance of Main Generators
703.32	Maintenance of Exciting Apparatus
703.33	Maintenance of Control and Protective Equipment
703.34	Maintenance of Transformers and Converting Apparatus
703.4	Maintenance of Miscellaneous Power-plant Equipment
704	Steam Generated—Apportionment Account
705	Steam from Other Sources

Note: Class D companies use only the primary account numbers (701–5) without subdivision. Class A, B, and C companies use one or more decimals for subdivision.

Refinement Limitations.—A word of caution may not be out of place against too great refinement in accounting, particularly with respect to operating expenses. Some executives or regulatory authorities are apt to suggest certain refinements in regular accounting to provide information which is needed only occasionally and which can be secured from subsidiary records when needed at less cost than the alternative expansion of regular

accounting would require. Refinement in expense accounting is primarily for the purpose of promptly detecting and correcting inefficiencies and irregularities. If or when the savings effected by such refinement fail to exceed the additional accounting cost, the purpose of such accounting has been defeated. The general application of this principle is seen in the system of graded refinement illustrated above. Very large utilities will extend the class A accounts by keeping separate accounts for each station and substation, by geographical division of other expense groups, and by further subdivision of important accounts in a manner adapted to their particular circumstances. Accounting instructions recommend further refinement of this character, which will aid in better control of operations and not disturb the integrity of the prescribed accounting system.

Income Statement.—The totals of the operating revenue and operating expense accounts above discussed appear at the beginning of the income statement, which, as already stated, summarizes the entire operations of the company. The other items in this statement do not need analysis, for they differ only in detail from those commonly encountered. They are entered progressively, leading to a final statement of net income for the period. The arrangement of the items varies in different standard forms of statements, that of the Interstate electric railway being simple and suitable as an illustration.

If no auxiliary operations are conducted by a railway company, the deduction of operating expenses and taxes from operating revenues leaves "Operating Income." If, however, the company operates electric, gas, or other coordinate departments, their revenues and expenses are separately entered before operating income is reached.

The next group of accounts covers non-operating income of various kinds, including rental from leased property or equipment, interest and dividends from investments, and other miscellaneous items. Expenses or other costs are in some cases charged against the various items so that the amounts entered in the statement are net amounts. Under other systems the receipts and disbursements are separately entered in the income statement. The net total of non-operating income added to operating income gives "Gross Income."

Deductions from gross income include rents of property leased for large-scale operation, interest on funded and other debt,

amortization of debt discount and expense, miscellaneous taxes, and other sundry items. The deduction of these items from gross income leaves "Net Income," which completes the income statement.

Profit and Loss.—The disposition of net income is shown in a "Profit and Loss" account, which is a cumulative account, although such regular current appropriations as dividends are frequently shown attached to published income statements. Profit and Loss entries include such credits as current net income, profit on sales of property, donations, and delayed and miscellaneous items. They include such debit items as appropriations for dividends and for retirement and other reserves, loss on property sold, discounts extinguished, and delayed and miscellaneous items. The final profit and loss balance corresponds with the corporate surplus shown in the current balance sheet.

Balance Sheet.—The balance sheet, to which executives and bankers give particular attention, requires only brief attention. A public utility balance sheet does not differ essentially from that of any other corporation, but the peculiar character of the business has led to certain modifications in arrangement. It is customary in balance sheets to show the most important assets and liabilities first. In a mercantile establishment the most important asset is the stock or merchandise on hand, fixed assets being comparatively unimportant. In a public utility the most important item is its fixed capital, the total of supplies, cash, and other current assets being comparatively small. Public utility balance sheets, therefore, show fixed capital first among the assets. The surplus and reserve accounts of public utilities bear a different relation to revenues and fixed capital than do those of other corporations. These subjects are discussed at greater length in Chap. VIII.

Fixed Capital.—The fixed capital account of public utilities is subdivided with considerable refinement. The numerous accounts are grouped under such headings as Land, Structures, Generating Plant, Distribution System, and others appropriate to the class of business involved. One purpose of this subdivision is to facilitate an analysis of the charges made from time to time to see that there is no confusion between fixed capital and operating expense. The property items are also arranged with a view to possible analysis of retirement costs and maintenance and provisions therefor. For such purposes an agreement

between classifications of property elements for capital and maintenance purposes would be desirable, but such agreement has not yet been fully realized.

It has already been stated that when any property item is retired from service, the fixed capital account is credited with its cost, estimated if not known. This is true, at least, of larger items of property not replaced through routine maintenance work, whether or not some other property is installed in its place. If a new, similar, substitute unit costs more than the old one, the fixed capital account is increased by the difference. The usual retirement jobs involve some increase in fixed capital through increase in cost or size, or both, of the new units.

UNIT COSTS

In comparing the operations of different public utilities or the operations of a particular utility at one time with those at another, statements in dollars are ordinarily not sufficiently illuminating or conclusive, at any rate for a growing property. To facilitate such comparisons certain ratios and unit figures have been developed. The most common basis of comparison is through the operating ratio or the ratio of expenses to revenues, which will be discussed in another chapter. An analysis of revenues or expenses requires the use of a unit of service or product which, for an electric company, is the kilowatt-hour; for a gas company, 1,000 cubic feet of gas; and for an electric railway, the car-mile. By the use of such "yardsticks," unit costs of production, distribution, administration, etc., may be obtained, through which different properties may be compared with each other and the progress made by any one utility from year to year determined. No serious objections have been raised to the units in use by electric and gas companies, although it is necessary clearly to specify whether the units are those manufactured or those sold. There is a tendency, particularly with gas companies, to apply the units produced to the cost of production, and the units sold to distribution and other expenses. By injecting between the two groups a factor representing the unit cost of unaccounted-for product, the sum of all the unit figures becomes the total expense per unit sold.

The car-mile has not proved so satisfactory a unit for railways, as there is a wide variation in size and schedule speed of cars

under different operating conditions, resulting in quite wide variations in unit costs between city, suburban, and interurban properties, and between surface, subway, and elevated lines. For certain cost elements the car-hour is a more satisfactory unit, and the seat-mile, car-foot-mile, and ton-mile have also been proposed as alternative units for certain purposes. Railway officials have given much attention to this subject and have so far not agreed upon any general unit more satisfactory than the car-mile originally used.

BUDGETS

A discussion of accounting methods would not be complete without some reference to budget procedure. It is becoming the general practice of public utilities, as well as other corporations, to make forecasts of their operations and construction requirements in order that due attention may be given to the necessities for additional financing and other corporate needs. The usual budget practice involves the preparation, toward the close of each year, of complete estimates of revenues, expenses, taxes, interest charges, dividends, construction and other requirements, and the distribution of cash receipts and disbursements throughout the coming year. Preparation of such budgets, including an estimate for each account for each month of the year, involves a large amount of labor and necessarily diverts attention for the time being from other matters. A number of prominent utilities have adopted and are urging the general use of a so-called continuous budget under which a forecast for not less than twelve future months would always be available. Under this plan each month would see the preparation of the operating budget data for a month one year ahead, and such additions to and extensions of the construction program as may be necessary, sometimes extending far beyond a single year.

It is one of the fundamental obligations of public utilities to be ready at all times to render any service which the normal development of the community or the advent of new industries may require. It is, therefore, necessary to study future construction requirements with particular care, and, since these requirements involve an amount averaging possibly one-fourth or one-third of the annual revenues, it is further important to determine the extent to which cash for construction purposes can be obtained temporarily from current operations, and what resort must be

had to permanent financing. For this reason budget estimates must cover the entire range of public utility activities.

AMORTIZATION

Reference has been made in this chapter and elsewhere to provisions for amortization of certain charges. Such procedure is a proper and routine accounting detail in many cases and the subject is here mentioned because of a tendency to carry the process to an undesirable extreme. Among the things that should be amortized are debt discount and expense, costs of term franchises, patent rights, and other charges which cease to represent value on a definite future date; also other charges which are subject to recurrence from time to time, such as large expenditures for appraisals and other rate investigation activities. On the other hand, large expenditures are sometimes made of a more permanent nature, such as investigations of new fields of service, which might be either capitalized or gradually charged off through expense by amortization. The latter method is frequently urged without regard to the financial condition of the utility or a clear understanding of what amortization involves. It is even proposed that capital issues or substantial parts of them should be amortized.

As between amortization and capitalization it should be remembered that the former always costs more for the time being. It means a burdening of present utility patrons in order that those of the future may be relieved. Therefore, before deciding upon amortization in any particular case, the circumstances should be carefully analyzed to see if that procedure is justified or if it involves unwarranted present burdens. Examples of questionable amortization include promotion and organization costs of a public utility project or preliminary investigations and plans of new developments connected therewith. The permanence of the thing for which expenditures are made should be carefully considered. This comment might also be applied to the disposition of certain overhead charges originally incurred in connection with the construction of property elements now to be retired. The simplest procedure is to retire all such overheads through the reserve for retirements, created through methods similar to amortization, although some of these overheads will not be replaced by others and their value will still remain. Here again, a careful analysis is required to see that no unjustifiable burdens are imposed upon either present or future patrons.

DEBITS AND CREDITS

Many persons who have occasion to study accounting entries and records but have not been trained in their technique are sometimes confused in distinguishing the debit and credit accounts and entries which are essential to the universally used double-entry system. Even the layman knows that costs of operation are "charged" to expenses and something else concurrently "credited," and that fares and other charges for service are "credited" to revenues and some other account concurrently "charged;" but with other less common transactions it is not so clear which account should be charged and which credited. The absence from many books on accounting of simple rules for clarifying this situation is the only excuse for here attempting a statement of such rules as an aid to the layman in examining public utility or other records.

It should first be remembered that the books of account of a productive enterprise are kept by those in charge of the operations and reflect the faithfulness of their stewardship. These books record transactions involving money, materials, services, and other things of value which are either received or surrendered. When things of value are received a responsibility for their safety or beneficial use is assumed, and appropriate accounts are accordingly charged or debited, these two words having the same meaning. When value is surrendered the responsibility therefor ceases and the appropriate accounts are credited. Transactions involving cash are the simplest illustrations. Cash is received for a sale of merchandise; the cash account is charged and a merchandise account credited. Cash is paid out for services; the cash account is credited and appropriate expense, capital, or other accounts are charged. A payroll account may intervene with successive charges and credits.

In the above illustration the treasurer or other corporate agent receives money or other things of value and becomes charged with responsibility therefor. In return he surrenders other things of value and is relieved of further obligations regarding them, the accounts in which they were previously entered being accordingly credited. Many other transactions occur in which value is not received and surrendered but is transferred from one corporate function or activity to another through journal entries, without involving any outside parties. In such cases it is the activity or the account representing it which is

debited or credited with value received or surrendered. When fuel is taken from a storage pile and used for power generation, no cash is involved, but the supply account is credited and the appropriate expense account charged with the cost. When a unit of property is retired from service, fixed capital is credited and retirement reserve or other appropriate account is charged.

Some of the above steps appear wholly logical, but others may lack obvious consistency. In the last illustration above, both credit and debit entries operate to reduce the totals of the accounts affected. The explanation involves the fundamental character of the accounts affected. A balance sheet shows assets and liabilities in suitable detail. The former are also called debits because they represent the property or other value, title to which has been acquired. The latter are also called credits because they represent securities or other value which have passed out of the hands of the custodians of the property, have been assigned to others, or have been otherwise accounted for. In a balance sheet, as well as in general accounting practice, debits are conventionally shown in left-hand pages or columns and credits in right-hand pages or columns. A debit entry to a debit account or a credit entry to a credit account involves an increase in the total, but a credit entry to a debit account or debit entry to a credit account involves a decrease in the total. This is the case in the retirement illustration referred to above.

A few further illustrations of common accounting entries may be helpful. An electric company delivers to its customers current, for which monthly bills are rendered. These bills, representing money due, are charged to accounts receivable, and profit and loss is credited through the medium of appropriate revenue accounts. When the bills are paid, cash is charged and accounts receivable credited, the transient function of the latter having been fulfilled. In this last step debit and credit entries to debit accounts result in increase and decrease respectively. In the preceding step a debit to a debit account and a credit to a credit account cause increases in both. Cash and profit and loss remain as the general debit and credit accounts built up from such transactions.

Disbursements made in the conduct of the business may affect either or both of these accounts. Money may be expended for new facilities charged to fixed capital, cash being credited. Accruals are made monthly for recurrent interest payments on

out-standing indebtedness, profit and loss being charged and an accrued interest account credited. When the interest is due, the accrued interest account is cleared by a debit and cash is credited.

Rule.—In the light of the above statements of procedure, a general rule covering debit and credit entries is now in order:

Debit or charge appropriate accounts to record:

Value received.
Increase in assets.
Decrease in liabilities.
Expenses or losses incurrea.

Credit appropriate accounts to record:

Value surrendered.
Decrease in assets.
Increase in liabilities.
Gains or profits made.

This rule is admittedly too brief to cover all forms of accounting entries, but embodies the features which have been found helpful to practicing accountants. It is intended only as an aid to an understanding of accounting procedure, for no complex science can be fully explained in a few words or pages. Such understanding will be promoted by clearly distinguishing debit and credit accounts.

A layman is apt to contend that accumulated profits are not logically a liability. They are not a liability of owners of the property, but the accounts do not represent proprietorship, but, rather, agents of the owners in the conduct of the business. After the agents have paid operating expenses, taxes, and interest, and have disposed of a part of the net income through authorized cash or stock dividends, appropriations to retirement and other reserves, writing off of business losses, and otherwise, the surplus which represents the remaining undistributed profits is a liability of the agents to the owners.

MODERN TERMINOLOGY

The accounting terms used in this chapter are those which have been standardized in modern practice. They differ largely from those formerly employed when "earnings" and "profits" were the basic terms, now replaced by "revenues" and "income."

Many public utility executives regret the disappearance of the word "earnings" from their technical vocabulary, because it signified the results of aggressive work, whereas "revenues" suggests something that flows in more or less automatically. As stated in another chapter, modern income accounts contain too much detail for use in the necessarily brief income statements prepared for the investors or for publication for other general purposes. For convenient condensed statements, the older terms may well be used in place of the modern terms to avoid confusion. There is little excuse for the continued misuse of modern terms, which is frequently found in financial advertising, and other widely distributed literature, where, for example, "income" is used in place of "revenue." Such misuse and confusion should be corrected as speedily as possible through education in the use and meaning of standardized terminology.

Further confusion is frequently encountered in connection with certain balance sheet accounts, particularly funds and reserves. One occasionally reads in published discussions the statement: "A depreciation reserve is a fund," with explanation of its uses. A fund is represented by cash in the custody of the treasurer and is an asset or debit. A depreciation fund is a debit account accumulated to offset depletion in fixed assets. A depreciation reserve is that part of the profits of the business which has been assigned to this specific purpose and is no longer available for other corporate purposes. It is, therefore, a liability or credit until used to retire assets which have ceased to be useful.

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CHAPTER VI

REGULATION

An old adage tells us that "Competition is the life of trade." Not only have trade practices in general been built up on this principle, but for many years federal laws have been in effect to enforce an effective degree of competition. The Federal Trade Commission is constantly on the alert to enforce the provisions of the Sherman Act of 1890 and more recent supplementary acts prohibiting combinations in restraint of trade. The United States Steel Corporation, which produces slightly less than 50 per cent of the steel products of the country, and certain consolidations in the packing industry, that would result in somewhat similar percentages, have been given particular attention.

GENERAL RESULTS OF COMPETITION

The result which is sought through competition is an adequate supply of commodities of suitable quality at reasonable prices. It is generally believed that this result is accomplished, although even a superficial survey of retail business methods shows that this is not wholly true. Every large community has a considerable number of stores dealing in the same goods, each with a force of clerks sufficient to give prompt attenton to customers even during active trading hours. At other times these clerks are idle. The total amount of such wasteful idleness is very much greater in a number of small stores than in a few large stores handling the same volume of business. The multiplicity of delivery teams, including grocery, milk, ice, and other service, is also wasteful. Encouraging steps have been taken to coordinate delivery service in certain lines, but it is still true that the cost of distribution of commodities is grossly disproportionate to their cost of production, and the problem of more economical methods is still to be solved.

SUBSTITUTES FOR COMPETITION IN UTILITY FIELD

It has been noted that public utilities are, in general, not subject to this law of competition and that the alternative

monopolistic character of their business has brought about coordination of facilities, reduction in the required investment and in the number of employees, and an increase in efficiency. Such exemption from anti-trust legislation calls for other means of accomplishing the results for which such legislation is intended, namely, adequate service at reasonable rates. Three methods have so far been employed: (1) franchise stipulations, fixing the character of service and the rates to be charged; (2) legislative acts or ordinances passed from time to time with similar intent; (3) regulation by state or local authorities.

Franchises.—It has been seen that attempts to fix service standards and reasonable rates through franchise provisions covering a long period of years have proved entirely unsatisfactory and inadequate. It is impossible to foresee years in advance the character of service which a growing community may need, or to anticipate with any approach to accuracy the cost of such service. The rate provisions in franchises have usually applied to maximum rates only, and the limits fixed in older franchises for service other than by electric railways were materially in excess of the costs under the more modern conditions of service with larger and more efficient equipment and vast expansion of the field of service. On the other hand, the fare limits imposed upon electric railways have been found excessively low under the conditions of greatly extended and improved service and vastly increased labor and other costs during and subsequent to the World War. It is, therefore, commonly recognized that franchise agreements cannot satisfactorily and continuously enforce the desired results of adequate service at reasonable rates.

Legislation.—The second method of accomplishing these results through legislation has been similarly unsatisfactory, not for the same reasons, although these reasons in part apply. A large body of legislators or a city council, with a multiplicity of duties and interests and without special knowledge of the peculiar problems and characteristics of public utility service, is often influenced by political rather than economic considerations and therefore cannot formulate and maintain legislation which will continuously require adequate service at reasonable rates.

Regulation.—The third method of controlling the service and rates of public utilities, regulation, avoids the defects in the other methods above mentioned, and, through its successful operation

for a considerable period of years, has come to be recognized as the best-known method of dealing with the situation. Regulation is effected through legislative acts and is a delegation of legislative authority to a subordinate body. While the acts of such subordinate bodies have many judicial characteristics, they are entirely distinct from those of the judicial branch of government which, as will be pointed out, serves to restrain and interpret the acts not only of the legislative branch of government but the coordinate executive branch, these three branches constituting the fundamental system of American government.

HISTORY OF REGULATION

It will be interesting at this point briefly to review the history of regulatory bodies. Regulation was first applied to railroads about eighty years ago when the total railroad trackage in the United States did not exceed 4,000 miles. Two railroad commissions were established in New England in 1844—New Hampshire and Rhode Island. Four others were established in Maine, Vermont, Connecticut, and New York in the fifties. The Massachusetts Railroad Commission was established in 1869. In 1885 railroad commissions existed in twenty-seven states. Their duties and powers were quite limited, including primarily the collection of statistics, enforcing of safety provisions, investigations of adequacy of service, and the rendering of annual reports of railroad operations to their legislatures with recommendations as to needed new legislation. Because of the interstate character of much railroad business and the impossibility of its adequate regulation by state commissions, the Congress in 1887 established the Interstate Commerce Commission. Its early powers were also limited, and it was not until 1906 that it was given full jurisdiction over railroad rates. Its powers have since been further increased, but, since they deal exclusively with interstate service and primarily with railroads, they will not here be given further attention.

The first state commission having jurisdiction over local public utilities was organized in Massachusetts in 1885. It first dealt with gas companies only, but two years later it was expanded to include electric light companies. In 1888 this commission first had supervision over rates in a limited way, and in 1894 it was given control over capital issues, thereby extending its scope to practically the full range of present-day regulation. This com-

mission was always conservative in its proceedings, and adjusted rates without resort to valuations, in view of its control of capitalization and the strict state laws with respect to capitalization which had previously been in force. Supervision of a limited character over local public utilities was instituted in Virginia in 1903, in New York State in 1905, and was also exercised by a considerable number of cities throughout the country.

It may fairly be said that, aside from the pioneer work in Massachusetts, modern regulatory methods through state commissions had their beginning in 1907 when the states of Wisconsin and New York established commissions having very broad jurisdiction and authority over all forms of public utilities and intrastate transportation. From its beginning the Wisconsin Railroad Commission has rendered decisions which, for thoroughness of investigation, soundness of reasoning, and impartiality of findings, have commanded universal respect.

Following the organization of these commissions in 1907 and their immediate success, other states rapidly adopted similar methods to meet urgent needs of utility supervision. For a period of more than ten years, at least one commission was organized in each year, in many cases by the expansion of the powers and duties of a previously existing railroad commission. At the present time every state in the United States except Delaware has a regulatory commission exercising duties over a part or all of the public service within the state. The District of Columbia and the insular territories of Hawaii, Porto Rico, and the Phillippines also have commissions with broad powers. The commissions in nine states (other than Delaware) still lack broad jurisdiction over local utilities, being limited largely to railroads, communication companies, and, in some cases, interurban railways. Thirty-eight states, the District of Columbia, and the territories of Porto Rico, Hawaii, and the Philippines have commissions with broad jurisdiction over all classes of public utility service. Further details of the powers and duties of the several commissions may be found in the 1923 annual report of the Committee on Public Service Securities of the Investment Bankers Association of America.

COMMISSION PERSONNEL

Regulatory functions are performed by comissions having from three to seven members. Only one state (Pennsylvania) has

seven, and only a few have five. Thirty-six of the state commissions have three members. The members of these commissions are either appointed by the governor, usually with confirmation by the upper branch of the legislature, or elected by the people. The former method is more common, being in effect in at least twenty-six states, and is much to be preferred because of greater freedom from political influences and obligations. As will be seen, the pressure of public influence and disapproval of rate increases are frequently pronounced, and any means of removing the commissioners as far as possible from tendencies opposed to unprejudiced action cannot be too strongly recommended.

The term of office of the commissioners runs from three to ten years, with six years as the common practice. Where three commissioners have such term of office their periods of service are staggered, one expiring every two years, for maximum continuity of practice and policy. Six years should be a minimum of such offices, requiring special training and experience, some of which can be gained only by actual service. If assurances could be had of a standard of character and qualifications corresponding with that of judges of the higher courts, it would be in the interests of effective regulation to make the appointments for longer terms than now prevail, if not for unlimited periods.

The application of the recall system to appointments of this character is as fully deserving of condemnation as its application to judges. A commission in a western state recently authorized increases in rates, which, naturally, were not popular with the customers. A recall election was held and the members of the commission responsible for the decision were retired and replaced by men believed to be in sympathy with the public views. No evidence was presented during the election to show that the decision of the commission was unfair or had failed faithfully to observe the requirements of the law under which it operated. It is obvious that equity cannot be assured under such circumstances.

It is apparent that the exacting duties of a commissioner call for broad experience, sound judgment, and freedom from political bias or influence. Men of such qualifications, unless possessing some independent means, cannot be secured without personal sacrifice for the salaries which are now offered, ranging from

about $2,000 per annum minimum to $15,000 per annum maximum, with an average not far from $5,000. The salaries paid may be consistent with those in effect in other public offices of similar responsibilities, including judges of state courts, but it is true of most of such offices that the compensation is not consistent with the responsibilities, thus tending to the inefficiency which characterizes our public service.

The commissions are usually provided with a staff of assistants to handle their clerical, accounting, engineering, legal, and expert rate service, thus relieving the commissioners themselves of routine work and giving them opportunity for broader activities and the formulation of sound regulatory policies.

SCOPE OF REGULATORY ACTIVITIES

It is now in order to consider the extent of the activities of the regulatory commissions. Their most prominent function is the regulation of rates, which includes the establishment of either maximum rates or complete rate schedules, depending upon the conditions of the regulatory acts.

Rates.—Rate proceedings are initiated upon petition of customers or utilities, or occasionally by a commission upon its own motion. It is also the duty of the commission to enforce the provisions of the law against discriminations in rates to the end that all customers having similar service shall pay the same rates. This latter function has been found of value not only to customers but also to the companies themselves, because it relieves them from insistent urging of customers for special concessions on account of alleged favorable conditions of service.

Service Standards.—Another important regulatory function is that of prescribing and enforcing reasonable standards of service, such as continuity, voltage regulation, B.t.u. content of gas, frequency of car service or the number of seats to be provided in proportion to passengers under different circumstances, testing of meters for customers, inspections of property with a view to safety and efficiency of operation, and study of accidents and their causes. A considerable number of the commissions have prepared and published elaborate rules and regulations covering not only the matters above listed but also standards and character of construction, specifications for grade crossings, adjustment of inductive interference problems—all in the interests of continuous, safe, and efficient service.

Extensions.—The commissions also have important duties with respect to extensions of public utility property. Many such extensions to reach new customers or districts are made as a matter of routine by the companies. Cases frequently arise, however, where the customers are remote from existing facilities. requiring large expenditures with comparatively little revenue, Where the business as a whole is remunerative, the utilities may not hesitate seriously with respect to these extensions, which may in themselves be unprofitable for a considerable period. On the other hand, if extensions would be and remain a serious burden upon the system, possibly requiring higher rates or preventing reductions otherwise possible, the wisdom of making these extensions may well be questioned. Where the utilities and their respective customers cannot agree in such matters it is the duty of the commission, in the light of all the circumstances, to decide whether such extensions should be made.

Accounting.—Most of the commissions are authorized to establish standard accounting systems to be used by the utilities under their jurisdiction. The primary purposes of such standardization are to secure uniformity in the annual reports which the utilities make to the commission, thus permitting accurate comparisons, and to insure correct methods of accounting for operating expenses and additions to and retirements of property, so that misrepresentation may be avoided. In certain cases the commissions are not only authorized to establish standard accounting systems but to prohibit the keeping of any other accounts or even memoranda respecting the business of utilities, and to keep all the accounting records of the utility within the jurisdiction of the commission at all times, subject to its examination. The commissions may require annual reports on forms which they prescribe and special reports of operation or construction in connection with any investigations which may be in progress.

Capitalization.—A small majority of the commissions (twenty-six in number) have jurisdiction over the capitalization of utilities. The utilities are required, in connection with any contemplated long-term issues of securities, to file with the commission a statement of the character and amount of the proposed issue, the purposes for which the proceeds are to be used, and other data which may be pertinent with respect to existing capitalization, available income, etc. The approval of the commission is

required before the securities can be sold. One state (Pennsylvania) modifies this practice to some extent, in permitting the utilities themselves to determine the character and amount of required new financing and to put it into effect under strict requirements of existing laws, but, coincidentally to file with the commission a so-called "certificate of notification," embodying all the pertinent facts with reference to the issue, and thereafter to report to the commission from time to time as to the actual disposition of the funds so acquired.

Purpose in Pennsylvania Practice.—Underlying the Pennsylvania provision is apparently the thought that utilities in their financing may be trusted to carry out the express provisions of law as to the character of the securities and the purposes for which the proceeds shall be used, and that the delays and resulting possible loss of market incident to approval by the commission prior to the sale of the securities serve no useful purpose. It may be significant that the regulatory laws of nearly one-half the states are silent with respect to capitalization. Presumably, the general laws of these states affecting corporations prescribe the conditions under which capital may be issued and provide the machinery for supervision of such issues and penalties for violations of the law. Where such laws are in effect for all corporations the purpose of supplementary and more stringent laws for public utility corporations is not apparent, particularly when it is considered that rate regulation ordinarily ignores capitalization entirely.

It may be said that, while rates or service may not be affected by excessive or improper capitalization, these factors being subject to independent control by the commission, protection against misrepresentation and loss is desirable for the purchasers of the securities. Such protection is provided in an increasing number of states through so-called "blue-sky" laws, under which all securities sold within the state must be approved by designated authorities. The question may, therefore, be raised as to what useful purpose is served by supplementing general and special laws with respect to capitalization by still further regulations in the case of public utilities, and by burdening the regulatory commissions with their administration. Apparently, many states think no danger exists to justify the burdens placed upon the commission and the utilities. A feeling exists, nevertheless, on the part not only of many states and their commissions, but of

RATE CASE PROCEDURE

It will next be in order to review the typical procedure of the commissions in rate cases, which are, perhaps, the most important of their functions. If a complaint of excessive rates is made to the commission by a municipality, a trade organization, or a group of customers, as required by the regulatory law, the commission at once notifies all parties at interest, setting a date for a hearing. This, at any rate, is the procedure where it is obvious that formal action is necessary. Many minor complaints are informally settled by the commission with or without conferences with all the interested parties. If the matter at issue requires extensive preparation of evidence and an examination of corporate records, the preliminary hearing will be adjourned or postponed to an agreed-upon date when all parties are ready to proceed. In the meantime the utility or the petitioners or the commission, or possibly all three, may prepare appraisals of the property used in the service in question. It is sometimes agreed that the commission shall make an appraisal of the property for all interested parties, the petitioner and respondent reserving the right to criticize and offer amendments to the valuation submitted. This subject of valuation involves so many complications and has for many years been the subject of such extended discussion and controversy that it will be given further consideration in a subsequent chapter.

Hearings.—When the formal hearings are held in a rate proceeding, evidence is presented as to the valuation of the property, based upon appraisals which may have been made or upon accounting records of investment or both. Testimony may be offered as to a fair rate of return upon the value of the property or "rate base," as it is sometimes called, and the provisions which should be made for depreciation. The records of the utility will be presented showing the current operating expenses, taxes, and any other pertinent charges incurred by the utility in conducting its business. After the close of the hearing the parties are given opportunity to prepare briefs summarizing the evidence and citing precedents and authorities for the findings which are urged. After due consideration of the case the commission renders its finding as to the need of changes in rates and in most cases may fix the rate schedules which shall be in effect on a future specified date.

Rule for Fixing Rates.—The rule generally accepted as controlling in such cases is that rates should be sufficient to cover the

necessary operating expenses and taxes, provision for depreciation or retirements, and a fair return upon the value of the property devoted to the public service. Controversies in rate cases do not usually include operating expenses or taxes, which are matters of record, but are centered on the value of the property, the return to be allowed thereon, and the provision for its upkeep. Each of these matters is of such importance as to warrant extended discussion in later chapters.

Appeal.—The decisions of regulatory commissions are not final or binding upon the parties at interest to any greater extent than are direct legislative acts which are subject to attack upon constitutional grounds or otherwise. Regulatory laws, therefore provide a method of appeal to the courts of the state when either party is aggrieved at a decision of the commission. Alternative appeal is available in important cases to federal courts, and many utilities resort to the federal courts when confiscation is alleged because they anticipate a more strict recognition of property rights in federal than in state courts. The respective duties and limitations of commissions and courts in rate cases are discussed in P.U.R. 1918 B. 28.

Cost vs. Value of Service.—One important phase of rate regulation needs attention at this point because of widespread misconceptions. Running through the history of rate adjudication is the thought that, although rates should be calculated on the basis of cost of service, the rates actually authorized should not exceed the value of the service to the user. The common inference has been that the value of the service may be less than its cost and, consistent with this inference, sundry decisions have fixed rates lower than full cost of the service. A search of these cases has not disclosed any in which the value of the service has been determined in a definite or logical way. Such determination could, of course, be made for individual customers of a particular kind of service, and many cases can be found where people are without public utility service because they cannot afford it. Under present conditions it would be impossible to establish any rate for utility service which would bring it within the reach of all possible users, and there is no criterion by which to determine the percentage of any particular group of citizens who might be considered entitled to public utility service without regard to its cost.

On the other hand, there are countless decisions which clearly establish the principle that public utilities cannot be required

to render service at less than cost. This principle is clearly applicable to the business as a whole and should also apply to all substantial classes and branches of the business. There is, therefore, an obvious inconsistency in establishing rates below the cost of service except possibly under conditions where such rates would promptly develop an enlarged and profitable volume of business. This, however, is a field in which, under controlling decisions, the judgment of the utility rather than that of the regulatory body should be exercised.

A careful study of the advantages and conveniences of public utility service will show that, as far as retail service is concerned, it is usually worth more than it costs. This is particularly true with domestic electric and gas service and telephone service. In the industrial field competitive conditions are encountered and rates higher than the value of the service cannot be maintained. Accepting these conditions, it would appear that the intent of the court decisions in which value of service has been considered was that this value should be an upper limit beyond which rates could not go, the lower limit being the cost of service. In fact, this is no longer a matter of conjecture because the courts have carefully reviewed the matter and clearly stated that the zone within which rates should be fixed at the discretion of the commissions has as its lower and upper limits the cost of the service and the value of the service, respectively.

This view is clearly stated in the following extract from a Federal case:

> Out of this situation it must evolve what the law terms a just and reasonable rate, which when made by compulsion of public authority can never exceed the value of the service to the consumer and cannot be made so low as to confiscate the property devoted to that service. Or, as expressed by the Supreme Court of the United States in *Smyth vs. Ames*, 169 U.S. 466, 42 L. ed. 819, 18 Sup. Ct. Rep. 418, the reasonable worth of the service rendered is the maximum of the permissible rate and a fair return on the value of the property employed for the public convenience is the minimum. It must fall between these two extremes.[1]

Such findings tend to simplify the rate problem, particularly for electric companies with their complicated rate structures, in

[1] *Re Public Service Railway Company*, 276 Fed. 979; P.U.R. 1921E, 632, 639. See also *City of Portsmouth vs. Public Utilities Commission* (Ohio Sup. Ct.), 140 N.E. 604; P.U.R. 1923 E, 834; and *Public Service Gas Co. vs. Public Utilities Commissioners* (N. J. Ct. of Errors & Appeals), 87 Atl. 651, 655.

that closely competitive business may be secured on a comparatively narrow margin and non-competitive business on a more liberal one, to the ultimate advantage of both classes through the resultant improved economy.

HOME RULE VS. STATE REGULATION

What has so far been said on the subject applies primarily to state-wide regulation of all intrastate business. This method of regulation has not met with universal approval throughout the country. Some states have strong leanings toward home rule in their larger cities, and state regulation is lacking in some cases because cities have been unwilling to relinquish the powers of regulation which they now possess. Several of the state regulatory laws now in effect provide that cities already having regulatory rights under their charters may retain these powers to the exclusion of the state commission if they so desire. In one state, Louisiana,[1] it is permissible for the cities at will, by popular vote, to relinquish their regulatory powers in favor of the commission or thereafter to take away these powers from the commission and resume them themselves. Such elastic home-rule provisions involve undesirable possibilities. A city having relinquished its regulatory powers may desire to reduce the rates of local utilities and be unable to convince the state commission of the justice of such reduction. By voting to resume its powers of local regulation, such city may subsequently bring about the desired reduction in rates, subject, of course, to injunctive rights of the utilities where confiscation is involved. Under other circumstances a reversal of the above procedure might be undertaken.

Advantages of State Regulation.—A great deal of attention has been given to the question of state versus local regulation, and the almost unanimous opinion of qualified authorities is in favor of state-wide regulation. The arguments in its favor are:

1. A state can afford to employ permanently a qualified board of commissioners with a suitable staff of engineers, experts, accountants, etc., to determine impartially the merits of a particular issue, whereas no single city could maintain or employ a similar qualified staff except at prohibitive expense.

[1] Constitution, Art. VI, Sec. 7.

2. Even if the city were financially able to conduct a rate case involving one of its local utilities, it is itself directly interested in the outcome, and so it is in the position of plaintiff, judge, and jury, which is obviously repugnant to judicial procedure.

3. City officials elected to represent the interests of the citizens are subject to political and business influences which make it difficult, if not impossible, for them to render an impartial decision in a case involving the electorate on one hand and so-called "vested interests" on the other.

4. Even if not unduly influenced in their decisions, city officials are absorbed by a wide range of duties and problems and have no opportunity to give to complicated utility negotiations the intensive study and research which are necessary and which a state commission is especially qualified to give.

5. The operations of many of the larger utilities are not confined to single city boundaries, but extend into separately incorporated suburban territory or other large cities. Regulation by one city would, therefore, involve segregation of property value, revenues, operating costs, and other matters which are not directly recorded on the company's books. Independent regulation by a number of different municipalities affecting the same utility would be confusing and undoubtedly inconsistent and conflicting.

Advantages of Home Rule.—The principal argument in favor of local regulation is that local officials are more completely familiar with conditions affecting their local utilities and with local sentiment as to the extent and character of desired public service, and, therefore, can more effectively deal with regulatory problems than state officials who lack such intimate contact with the situation. There is a further argument that the states, having granted general police powers and other local control to municipalities, should not withdraw such rights respecting public utilities in the absence of impelling reasons for so doing.

In spite of strong sentiment in favor of home rule in certain sections of the country, it is, nevertheless, true that, where opportunity has been offered to municipalities to exercise regulatory powers in place of a state commission, such opportunity has not been generally exercised. It is undoubtedly true that the tendency of regulation is definitely in the direction of state rather than local jurisdiction, and it is probable that even those states favoring home rule will in time be willing to accept an appellate

jurisdiction by a state commission and that, under such an arrangement, appeals will ultimately so become a matter of course that local attempts at regulation will disappear.

INTERSTATE REGULATION

Reference has been made to the establishment and development of interstate regulation of transportation and communication agencies by the Interstate Commerce Commission. Such regulation has had points of conflict with the activities of state commissions, particularly during and since the World War, when interstate rates were radically increased. The state commissions failed in many cases to make corresponding increases in intrastate rates, the result being a provision in the Transportation Act of 1920 that intrastate rates should not be restricted to levels inconsistent and conflicting with interstate rates as prescribed by the Interstate Commerce Commission. The state commissions contested the legality of this apparent interference with state affairs, but the act in question was confirmed by the Supreme Court.[1] Similar but less significant conflict has occurred in other cases and an amicable and equitable solution of the respective jurisdictions is not yet in sight.

REGULATION OF MUNICIPAL PLANTS

Regulatory laws are by no means consistent in the treatment of municipal plants owned and operated in considerable numbers by cities and towns. The more progressive laws, such as those of Wisconsin and Massachusetts, confer upon the commissions the same jurisdiction over municipal plants as over private plants, but the majority of the regulatory laws are silent with respect to the former. The reason for this silence is that municipal plants, being operated without profit, are supposed to adjust their rates automatically to the cost of service and have no hesitation in giving a character and extent of service satisfactory to the citizens as a whole. The financing of such plants, which is through municipal bond issues, aside from the investment of reserves and surplus, needs no state supervision. Other commissions have urged the extension of this practice.

Accounting.—There is, however, one phase of municipal plant activities in which state supervision would be desirable, namely,

[1] *Wis. Railroad Commission et al. vs. C. B. & Q. R. R.*, P.U.R. 1922 C, 200; 257 U.S. 563.

accounting. The accounting methods of municipal plants are notoriously lax and inaccurate, and the results of operation shown by published statements rarely reflect actual conditions. For this reason the citizens in many of these cities are misled as to the results of municipal operations which, instead of being profitable as alleged, are actually losing money at the expense of the taxpayers generally. This fact has been recognized in a few states and the commissions are authorized to prescribe and supervise accounting methods for municipal plants over which they have no other jurisdiction.

STANDARDIZATION OF REGULATORY PRACTICE

Many public utilities operate in more than one state or are affiliated, through holding companies or otherwise, with other companies so operating. It is, therefore, desirable that regulatory methods, particularly with respect to accounting and rate cases, should be consistent so far as possible throughout the country. There is now definite prospect of uniform accounting methods but no standardization of other practices has yet been effected. Such standardization is, however, under consideration by committees of various national associations interested in the administrative, regulatory, legal, and financial phases of the public utility business, with the prospect that a uniform regulatory law will in due time be recommended for adoption in states which have yet to provide complete regulation over all utilities and for gradual modification of existing regulatory acts.

Desirable Features of Uniform Law.—The tendencies in the thought so far given to a uniform regulatory law, as expressed in recommendations of various bodies which have considered the matter, are, in general, consistent with the preferences expressed herein. A few of these recommendations are, however, worthy of further attention. It is proposed that the commissions, in addition to their usual staff of assistants, be authorized to appoint examiners who would from time to time be delegated to take testimony, examine witnesses, and otherwise assemble data in proceedings on the commission's docket, and to summarize the evidence presented and submit it to the commission with recommendations, as is done by examiners connected with the Interstate Commerce Commission and by masters in chancery in court proceedings. Such practice would lead to earlier disposition

of many unimportant matters which cumber the dockets of the commissions and prevent prompt consideration of important cases.

It is further recommended that the funds required for carrying on the work of the commissions be raised through general taxation rather than assessment on the regulated utilities. This is in accordance with present general practice, but the few existing exceptions have suggested the undesirability of the commissions' being supported by the utilities which appear before them in rate cases and are otherwise subject to their jurisdiction. In defining transportation agencies, classified as public utilities, there are included not only electric railways but also railless carriers, such as trucks, buses, and even airplanes.

It is also recommended that the commissions be authorized to approve service-at-cost and sliding-scale agreements between utilities and municipalities, and also otherwise to establish systems of awards under which utilities and customers would share in the benefits of improved operating methods and economies. The terminable form of permit is recommended for all new grants and to supersede existing franchises at the option of the utilities. The terminable permit plan provides for municipal purchase at a valuation to be fixed by the commission. The investment banking interests urge that the commissions be given supervision over security issues in order to make them more attractive to investors.

LATITUDE IN REGULATION

In general, the regulatory laws are silent with respect to one exceedingly important feature. In delegating authority to the commissions to prescribe reasonable rates they do not define the method by which such reasonableness shall be established, wisely leaving this to the discretion of the commission. The general practice, as above stated, has been to accept reasonable actual operating expenses and taxes, suitable provisions for property retirements or depreciation, and a fair return upon the value of the property as factors in the cost of service to be covered by the rates to be determined. The tendency has been to make the fair return a fixed rate, thereby making all cost elements more or less fixed.

Lack of Incentive.—Such an arrangement lacks an incentive for efficient operation and for liberality in service standards which

are essential to the ultimate success of regulation. The pioneer operators of and investors in public utilities had a definite incentive for aggressive development of their properties and prompt use of new inventions which would increase the profitableness of their operations. The stimulus of this early period has not yet disappeared, although regulation has been in general effect for a considerable number of years. In time it must become obvious to utility managers that, under prevailing regulatory methods, there is no definite incentive for continued adoption of new devices which will save labor or other operating costs when the results of the saving are not assured to the stockholders but will be passed along to patrons through rate reductions. Neither is there incentive for expansion of the business involving some risks if the maximum return is strictly limited and early losses may not be recovered. The tendency of the present methods of regulation is toward a degree of stagnation which is a menace to both the industry and its patrons. This menace can and should be removed. The method is not wholly clear in detail, but it is obvious that, where progressiveness and consistent aims toward increased efficiency are apparent, a higher rate of return authorized by the commission would stimulate the continuance of such methods.

Variable Rate of Return.—A few of the commissions have recognized this situation and have, in principle at least, recognized differences in administrative ability by differences in rate of return amounting to something like 1 per cent. At least two commissions (Wisconsin and Illinois) have worked out elaborate systems of grading public utilities with respect to adequacy and continuity of service, efficiency of operations, promptness in attention to service details, liberality in commercial policies, etc. The method of application of this system in rate practice has not yet been fully defined. It is not clear that incentive provisions should be limited to the rate of return. If, through special effort, operating costs are substantially reduced, it would not be unreasonable that some portion of the saving should be reserved for the owners of the property. Progressiveness in the matter of extensions of service would be encouraged by an allowance for intangible values in the rate base, intended to cover necessary early losses in the operation of such extensions. These and other incentives to sustained alertness and progressiveness must be given most careful attention in the future

if the utilities are to maintain their past record of expansion and ability to meet all reasonable demands for service.

GENERAL RESULTS OF REGULATION

This discussion of regulatory methods would not be complete without a more specific reference to actual results experienced since these methods became general. Beginning with 1915 the important decisions of all regulatory commissions have been assembled and published in a series of volumes, now numbering about fifty, entitled "Public Utilities Reports." These volumes contain the complete decisions in more than 5,000 cases. Of this number less than 500 have been appealed to the courts. In about 60 per cent of these appeals the commissions have been sustained. A study of 185 cases in which the commissions have been reversed discloses 171 cases in which the appeals were made by the utilities and 14 cases in which the cities or other opposing interests appealed. Of the cases in which the utilities were sustained, 145 involved the merits of cases affecting rates, service, and miscellaneous regulatory practices and acts, the remaining involving legal or technical questions, such as jurisdiction. Of the 14 cases in which the cities were sustained only 8 involved the merits of the case, and no one of the 8 disclosed any bias in favor of the utilities.[1]

It might be contended that a record of 5,000 decisions, disclosing no single case of pronounced leaning in favor of the utilities, must in many cases involve a definite leaning in the opposite direction. This is sustained by the fact that there were on appeal eighteen times as many reversals in favor of the utilities as in favor of the cities. On the whole, however, the record of these decisions—many of them during the war period when economic conditions were seriously disturbed—is not one which should discourage the utilities or any other interested parties. This is particularly true when it is considered that regulation is still in its formative period and full realization has not yet been had of the necessity of protecting the utilities, as well as their patrons, in the interests of both the general public and the utilities. The utilities favor regulation because it establishes a definite means of adjudicating the rights of all parties interested

[1] SPURR, HENRY C., "Shall We Go Back to Local Regulation of Utilities?" p. 11, 1923.

in their operations. Other methods have failed, and regulation, in spite of early shortcomings, holds forth promise of ability to meet changing conditions and to offer such protection to the parties at interest as will encourage continued expansion of the industry and its usefulness to the country as a whole.

LEGAL BASIS OF REGULATION

This chapter has not so far considered in detail the legal foundation upon which regulation exists or its historical development. Although it is possible only briefly to review this history, it is interesting to note that regulation in some form is very old. History tells us that it was applied in England more than six centuries ago to the prices of food and other commonly used commodities. While its aim was to relieve the poor from extortion, it was not wholly effective, as is shown by the following quotation from an ancient record:

> But, notwithstanding this *Act of Parliament* Things could not be purchased at these Rates, for People would not bring them to Market (and that is a thing that Parliaments cannot remedy) and so the King was fain to revoke the former *Act*, and leave People to sell as they could (for a Trade will do as it can, and never be forced, one way or other).

Regulatory practice in the United States has not followed similar lines, and its earliest application to public utility service is found in the so-called Granger cases in 1876.[1] Recognition was then first given to the right of states to fix railroad rates and, in the absence of any stated limitation to these rights, the decision was disturbing to the railroads, against which it was directed. The rights of state regulation of rates were reaffirmed ten years later by the Supreme Court in another railroad case,[2] but with the limitation that, under the pretense of regulating rates, the state could not take property for public use without due process of law. This limitation was confirmed in the *Covington and Lexington Turnpike* case,[3] and more clearly set forth in the *Smyth vs. Ames* case, decided in 1898,[4] which, as will appear in the chapter on Valuation, is the pioneer case on that subject. All these cases antedated the delegation by state

[1] *Munn vs. Illinois*, 94 U.S. 113.

[2] *Stone vs. Farmers Loan & Trust Co.*, 116 U.S. 307.

[3] 164 U.S. 578.

[4] 169 U.S. 466.

legislatures of their rate-fixing powers to the regulatory commissions with which this chapter has dealt.

The courts have consistently held that their duties do not extend to the fixing of rates, this being exclusively a legislative function, direct or delegated. The courts may set aside unreasonable rates and direct the substitution of rates consistent with their findings, but only in the rare cases where injunctions would restore less reasonable rates than those enjoined do they even temporarily name compensatory rates.

The responsibility of regulatory commissions was clearly recognized by Hon. Mark W. Potter of the Interstate Commerce Commission in a dissenting opinion in a railroad consolidation case decided shortly before his retirement from the Commission. The following quotation is taken from his statement:

> Proper regulation is not to take control of the exercise of private rights, but only to say what may not be done because it invades public right. As a basic principle liberty and freedom to the individual is the rule. Interference by regulation is the exception to be closely construed and given the most restricted application. One of the great menaces of the present day is the blight of regulation. It is essential that those in charge of it should dread their power and constantly be alert lest they misuse it.

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CHAPTER VII

VALUATION

The problem of condensing into a single chapter the essential features of the valuation of public utility properties is a formidable one but is, nevertheless, undertaken because it involves fundamental considerations in the successful functioning of the industry so far as it is subject to regulation. The literature on this subject, practically all of which has appeared within the last fifteen years, is voluminous and to a large extent controversial. It is only through liberal references to various books, papers, and decisions, which this literature includes and which the reader is urged freely to consult, that this necessarily brief discussion can be developed into an adequate or helpful picture of an involved subject which offers exceptional opportunities for clear thinking and the application of sound economic principles.

CONCEPTS OF VALUE

For general purposes the value of a commodity is the price which a willing seller will accept and a willing purchaser will pay. Such a definition cannot ordinarily be applied to public utility properties because they are not commonly bought and sold in the market places. The primary concern here is with value as it enters into the problem of rate making. Such a value may differ from that required for other purposes, such as taxation, capitalization, and sale. It is generally agreed that value for purposes of taxation is different from that involved in rate proceedings. There may also be elements of value appropriate in rate proceedings which are not involved in capitalization. The differences between value for rate purposes and for purchase or sale are less clearly defined and may be negligible.

The value of a producing property in the commercial market is determined largely by its earning capacity rather than the cost of the property or other factors. A purchaser will not pay more than the capitalized present or prospective net earnings when the

property is subject to the usual competitive conditions. The procedure in determining the so-called "fair value" of a public utility for rate purposes is directly opposite to the commercial procedure above outlined in that value is fixed for the purpose of determining future earnings instead of being determined from existing or anticipated earnings. The use of the word "value," therefore, for two such entirely different concepts appears confusing and unfortunate, and a different term for the special concept encountered in public utility rate cases is desirable. The term "rate base" has been used to a limited extent to represent the value of public utility properties for rate-making purposes,[1] and its more extended use appears desirable.

The significance of the rate base has been somewhat exaggerated in rate proceedings. It is only a step in the determination of the gross income to which public utilities are entitled, this income being obtained by applying a fair return percentage to the rate base. Extreme refinement in the rate base is useless to the extent that exactness is not possible in the rate of return. Furthermore, the income which is to be fixed is a minor although important factor in the total cost of service. Nevertheless, in spite of occasional magnified importance of the rate base, the methods of its determination and the elements to be included require careful attention.

METHODS OF DETERMINING RATE BASE

The earliest authoritative and comprehensive statement of the elements to be considered in determining fair value appears in the often quoted case of *Smyth vs. Ames*,[2] decided by the United States Supreme Court in 1898, although in several earlier cases this court outlined certain fundamental principles involved in regulation and valuation as has been shown in the chapter on Regulation. In that case it was held that original cost, cost of reproduction, market value of securities, and earning capacity, as well as any other factors pertinent in each particular case, should be considered. With the passage of time and the development of regulatory practice, the view was expressed that certain of these elements could not consistently be given consideration. It was claimed that the market value of securities, being fixed by

[1] *Re Pacific Telephone & Telegraph Co.* (*Wash.*), P.U.R. 1916 D, 947, 952.
[2] 169 U.S. 466.

earnings which in turn are derived from existing rates, could not be a factor in determining these rates.

The question of security values or "earning power" cannot thus be summarily dismissed. It is to be noted that such value in *Smyth vs. Ames* involved "rates prescribed by statute" and not an unregulated situation. It is undoubtedly true that, under a stable regulatory policy, the income resulting from authorized rates is commonly used by investors as a measure of value, although it may be the market value of the equity with which such investors are primarily concerned. Two properties with similar physical facilities and rates may have substantially different incomes due to load or traffic conditions that are favorable or otherwise. It may be impossible for one property to earn a fair return upon its bare physical value whereas the other may earn a liberal return.

The consideration of earning capacity in the *Smyth vs. Ames* case may be regarded therefore, not as an oversight or illogical reasoning on the part of the court, but as a recognition of non-physical elements of value arising from favorable location or operating conditions which are reflected in the earnings or expenses, but not disclosed by any evidence of original cost or cost of reproduction of the physical property. Such a view tends to diminish the differences otherwise existing between a public utility rate base and the commercial concept of value.

The two bases of value which have been commonly used and which receive the most attention by courts or commissions are investment and cost of reproduction. Because of the wide differences in value now resulting from these two methods of determination, and the controversies existing regarding them, the procedure in each case will be considered.

Investment

Investment, sometimes called original cost, is determined from accounting records. For properties of comparatively recent origin such determination can be made with accuracy. This is not true of older properties because of lack of standardization of accounting methods in early years or the lack of early records which were destroyed or, for other reasons, are no longer available. Under such circumstances it is necessary to make estimates of the original cost of the property not included in existing

accounting records based upon market prices of materials and labor at the time the property was constructed. Accountants experienced in the examination of old records often, by interpolation and other permissible methods, construct surprisingly complete statements of construction costs from records, annual reports, and minute books, which executives have thought to be worthless for such purposes.

The question at once arises in such an investigation as to what is meant by investment or original cost. Is it the cost of the various property elements when originally installed or is it the cost of the property to its present owners in the event of reorganization or outright purchase? The cost to present owners may be greater or less than original cost. Where the operations of the property had been successful, the purchasers in earlier years, in the absence of modern regulatory practice, might have paid substantially more than the actual cost. On the other hand, an unsuccessful property might be acquired through receivership proceedings or otherwise at much less than its original cost. Although no authoritative answer is available as to whether the original cost of the various elements or a purchase price for the property as a whole should be controlling, it is logical that present owners of the property should be interested in protecting their own investment therein, at least if made under normal conditions, in the exercise of good business judgment, and in accordance with practices prevailing at the time of purchase. From this point of view investment may then be defined as including the direct proceeds from the sale of the outstanding securities, the earned surplus which has been left in the business, reserves which may properly be considered as belonging to the owners, and, under certain conditions, the cost of property retired but not removed from fixed capital account, and necessary losses in operation during the early years. The conditional items will be given further consideration at another point. The courts have held that the payment made for property at a foreclosure sale is not a criterion of value.[1]

Although the actual cost of all the property elements is determined from accounting records, as indicated above, it is the almost universal practice in valuation proceedings to ignore this basis of value with respect to land, assigning thereto present value,

[1] *Steenerson vs. Great Northern Railway Co.*, 69 Minn. 353; 72 N. W. 713.

instead of cost, based upon available records and judgment of real estate dealers. This exception in the case of land is in deference to repeated decisions of the courts that the value of land is its present value. Such value is determinable much more readily in the case of land than for other kinds of property used by public utilities because it has definite market value based upon transfers of adjacent or otherwise comparable parcels. Other public utility facilities are ordinarily sold only when they cease to be useful.

Cost of Reproduction

The second basis of valuation, cost of reproduction, requires, as its name implies, the determination of the cost of duplicating the property used and useful in the public service. While there have been a few cases in which the cost of an equivalent substitute new plant has been used instead of the identical plant, such procedure has found little favor, although it would have sound economic basis under competitive conditions. The difficulties of setting up the cost of a substitute plant as a rate base are formidable, primarily because no two engineers would agree as to what such a substitute plant should consist of and the character of its units.

Historical or Present Conditions.—The next question that arises is as to whether the conditions under which the assumed reproduction of the property is to be made are those now existing or those prevailing at the time of the original construction. The differences are substantial. If present conditions are assumed, paving over underground construction and between tracks would be included, but many adverse conditions encountered in original construction, such as grading, grubbing, removing of buildings, and other obstacles which have disappeared in the process of community development, would be omitted. The question of paving has been much discussed in valuation proceedings, and the general opinion is that, where paving has been laid subsequent to the construction of the property, its laying or relaying should not be included in the valuation or should be included only to the extent of assessments or other costs actually incurred in connection therewith.[1] It is sometimes contended that such subsequent paving construction should

[1] *Re Cedar Rapids Gas Light Co.*, 120 N. W. 966, 970; affirmed in 223 U.S. 655; *Consolidated Gas Co. vs. Newton*, 267 Fed. 231; P.U.R. 1920 F, 483, 494.

be included as an element of value because it adds to the cost of operation and upkeep of the property. Such cost, however, is ordinarily included in maintenance and is, therefore, a direct rather than an indirect element in the cost of service.

Historical or Present Prices.—The result of the discussions of these points has been a definite tendency to assume the reconstruction of the property under the physical conditions existing at the time of its actual construction but with prices for materials and labor prevailing at the present time. "Present" as here used is subject to some modifications. Where important construction materials, such as copper, steel, and pipe, are subject to frequent market fluctuations, and the prices prevailing at the time of the inquiry are abnormal, it is common practice to take the average prices over a period of years which represents a reasonable cycle, with due allowance for any general upward or downward trend.[1] This, however, is not the universal practice. The prices which have prevailed during and since the World War have been so much higher than before, and have been subject to such wide fluctuations, as to raise some doubts regarding the propriety of using the prices of any particular period, or even of the war period as a whole, except for such parts of the property in question as have been constructed during this period. The so-called "split inventory" method, under which a pre-war valuation has been applied to pre-war property and actual cost of subsequent property added thereto, has been adopted by a number of commissions.[2] In other cases the average prices of a considerable number of years, including some pre-war years, have been used to get a more or less arbitrary a erage applicable to the entire property.[3]

In certain cases "trend" prices have been adopted, these being the prices which it is assumed would have prevailed during recent years if the World War had not occurred and the gradual upward trend of prices which had previously prevailed had continued. The difficulty with this method, as pointed out in a New Jersey case,[4] lies in an equitable determination of the pre-war trend.

[1] *Re Milwaukee Electric Railway & Light Co.* (Wis.), P.U.R. 1918 E, 1.

[2] *Re Capital Traction Co. (D.C.)*, P.U.R. 1919 F, 779; *Re Libby Water & Electric Co. (Mont.)*, P.U.R. 1922 E, 402.

[3] *Salisbury Light, Heat & Power Co. (Md.)*, P.U.R. 1918 E, 331; *United Public Service Co. (Ind.)*, P.U.R. 1918 F, 316.

[4] *Re Coast Gas Co.*, P.U.R. 1923 A, 349, 354.

A trend based on prices between 1896 and 1914 would yield materially different present results than a trend based on 1890–1914 prices. This method, therefore, because of its uncertainty and lack of logical foundation, has not been extensively used.

The stability of the general price level since the middle of 1921 has eliminated to a large degree the objections to prevailing prices on account of their abnormal character. It has been contended that the logical prices to be used in determining a rate base are those which are apt to prevail during the period in which the rates in question would be in force. A recent decision of the Supreme Court has confirmed the necessity of giving consideration to future as well as present prices.[1]

Factors Affecting Prices.—The forecasting of future prices is not a simple matter, and economists are not wholly agreed upon the factors which determine price levels. It is generally assumed that the quantity of money in circulation and the "turnover" or frequency with which a given amount of money is used for different transactions are contributory factors. Such, at least, has been the experience in the past. It is also believed that efficiency of production is influential, an increase in per capita production tending to reduce prices. The term "money" as here used includes gold and other authorized currency in circulation and, according to some economic authorities, should also include bank checks and other substitutes for currency used in general business. Such substitutes are, in fact, used for something like 90 per cent of monetary transactions, but their percentage has remained fairly constant for a considerable number of years, making it unnecessary for present purposes to decide whether they should be considered as "money." In connection with these basic factors it is to be noted that there is now in the United States about twice the percentage of the world's gold supply that there was prior to the war, that there is a wide substitution in other countries of paper currency for gold, and that the world supply of additional gold for monetary purposes and the arts is ample for a considerable number of years. Taking these and other pertinent conditions into consideration, it is the opinion of economic authorities that there will be no further radical decline in prices in the near future. One authority has fixed 1930 as the date beyond which definite predictions cannot be made.[2]

[1] *Re Southwestern Bell Telephone Co.*, 262 U.S. 276; P.U.R. 1923 C, 193.

[2] Harvard Economic Service, Weekly Letters, vol. 1, p. 137.

Appraisal Procedure. The procedure in determining the investment in public utility property has already been sufficiently indicated. The determination of cost of reproduction involves many details, some of which are the subject of controversy, and therefore require brief review at this time. In short, a cost-of-reproduction appraisal involves the preparation of an inventory of the items of used and useful property, the application thereto of suitable unit prices, and the addition to the value of the bare physical property thus determined of certain physical and non-physical overheads. No comments are necessary with respect to the preparation of the inventory other than to urge against too great detail. Such detail adds nothing to the accuracy of the work and is fruitful of controversy rather than amicable settlement of the matters at issue. Reference will later be made to the subject of "yardstick" methods through which so-called "curbstone," "horseback," or "swivel chair" appraisals are made.

Physical Items.—*Omissions and Contingencies.*—Before or in connection with the application of unit prices to the physical inventory, so-called omissions and contingencies should be given consideration rather than treated as overheads. Omissions and contingencies are, in reality, labor and material items which have disappeared, are concealed, or for other reasons cannot be listed, including such items as sag, waste, shortage, breakage, mill inspection, freight, cartage, storage, material checking and accounting, commissary, field superintendence, construction equipment and tools, temporary structures, such as coffer dams, storage sheds, and offices, losses due to storms, floods, quicksands, strikes, and delays in materials. These all have to do with the bare physical property and are so accounted for in actual construction records. In addition thereto so-called profits of general contractors and subcontractors should also be included. The function of such parties in public utility construction is frequently misunderstood, and the opinion is expressed that an allowance of 10 per cent or thereabouts for services of a general contractor is an unwarranted addition to the estimated cost of the property.

General Contractor's Services.—Contractors are employed on public utility construction as well as elsewhere in order to save money. This is accomplished through the accumulated experience and construction facilities which are at the command of the contractors, making it possible for them to execute work at a

lower cost, including their expenses and profits, than could be done by the owner of the property with his own forces and facilities. The saving through the employment of a general contractor is greater as the magnitude of the work involved increases, and it is wholly logical that a general contractor should be employed in the wholesale construction of a complete public utility property, such as is assumed in a cost-of-reproduction appraisal.

If a general contractor is employed and an allowance is made for his services, it follows that the unit prices used throughout the work logically supervised by the general contractor should be those which the general contractor would pay through his command of labor and material markets, rather than the higher prices which the utility itself would pay for independent construction. Care should, therefore, always be exercised that the unit prices used are not based on piecemeal construction where a general contractor's percentage is added, and that piecemeal prices should ordinarily be used where no provision for a general contractor is made.[1] The provision for contractor's services, where appropriate, is conventionally 10 per cent on the cost of the work involved.[2] The whole problem is that of assuming the conditions under which the construction could be executed at minimum cost and using the appropriate unit prices and allowances for supervision.

As far as possible the miscellaneous items above referred to should be included directly in the material and labor costs and not as additional percentages. It will not be possible or convenient so to include all of them, and to that extent percentage additions should be made to the material and labor costs. The extent of the additions will depend upon the refinement of the items so included and the thoroughness of the inventory and inquiry into the actual conditions of construction.

The percentages allowed for omissions and contingencies commonly range between 2 and 10 per cent, although in a few cases commissions have held that no allowance should be made for such items, on the theory that where a careful inventory is made the probability of overcounting or estimating is as great as of undercounting. Experience in checking completed appraisals

[1] *Re Newton Gas Co.* (N. Y.), P.U.R. 1916 D, 825, 841.

[2] *Re Antigo Water Co.* (Wis.), 3 W.R.C.R. 623; *Re Cripple Creek Water Co.* (Colo.), P.U.R. 1916 C, 788.

and in actual construction work shows clearly that this is not the case, such checks almost invariably disclosing omitted items and errors which more than offset other corrections and result in increased net totals. In one reported case a review of a carefully made appraisal disclosed new items aggregating 7¾ per cent of the original total.[1]

It is customary in making construction estimates to allow at least 10 per cent of the specific estimates for so-called omissions and contingencies. A study of the actual costs of a group of construction projects estimated to cost $600,000,000, including a 10 per cent allowance for contingencies, showed that actual construction cost was $598,000,000, and the engineers estimated that more than 50 per cent of the contingent item in the estimate was absorbed in work which would not be disclosed on the completed job. This would indicate that an allowance of 5 per cent is not unreasonable in a careful inventory, although this is somewhat higher than the allowances usually made by the commissions.[2]

Land Factors.—Included in the material items of public utility property is land about which controversies have arisen, particularly in the case of rights of way. The value of real estate is usually based upon prices disclosed in recent transfers in the same neighborhood, plus the additional costs incident to the assembling of a number of lots from independent owners. This procedure, however skillfully handled, usually results in some increase over the market prices of single lots, and is covered by the item of plottage. For rights of way this item assumes larger proportions. A continuous strip of this character cannot be acquired without publicity and, in addition to plottage, involves severance damages where farm or other lands are broken through, and also a hold-up factor, the extent of which is determined by the general public's attitude toward the project and the expense and complications involved in alternative condemnation proceedings.

It has been the usual experience of railroads and interurban railways that rights of way are apt to cost from two to three times as much per unit of area as the value of adjacent lands,

[1] *Elec. Ry. Jour.*, May 14, 1921, p. 891.

[2] *Re Grafton County Electric Light & Power Co.* (N. H.), P.U.R. 1916 E, 879; *Re Mountain States Telephone & Telegraph Co.* (Colo.), P.U.R. 1917 B, 198; *Re Westmoreland Water Co.* (Pa.), P.U.R. 1917 D, 478.

even after all reasonable efforts have been made to keep the cost to a minimum consistent with satisfactory present and future public relations. Right-of-way multiples were disallowed in one leading Supreme Court case which has often been cited in arguments against such multiples.[1] The circumstances of that case, however, were not wholly consistent with those here assumed in that the values before multiples were applied included enhancement due to the railroad location itself and other facts of increase which the court considered as incompatible with or a substitute for multiples. The appraisal of generating plants, car barns, warehouses, distribution systems, track, etc., presents no such special difficulties.

Overhead Charges.—The direct material and labor costs shown up to this point in an appraisal, including the overheads mentioned, have commonly been designated as "structural cost" or "specific construction cost." To such total there must be added general physical and non-physical overheads, which so far have not been definitely classified in appraisal practice but which may for convenience be listed as follows:

Physical:
- Administration and legal
- Engineering and supervision
- Insurance and damages
- Taxes
- Interest
- Financing
- Supplies

Non-physical:
- Promotion
- Organization
- Cash working capital
- Riparian rights
- Franchise value
- Going value

Such items as interest and financing might be classified as non-physical, but are here listed with the physical items because they are so closely related to the structural costs. The exact arrangement of the items has no present significance. The following comments apply to the various items and groups of items tabulated above, with a statement of the allowances which

[1] *Minnesota Rate Cases,* 230 U.S. 352.

have commonly been made by courts and commissions therefor. It is later pointed out that in many cases such allowances have been inadequate and inconsistent with accumulated experience, but they are, nevertheless, given as a matter of record. It is difficult to make any concise yet definite statement of overhead allowances included in official valuations because of the wide range of such allowances, entire omission of certain items in many cases, and lack of uniformity in grouping or classification. With increasing experience in valuation work and the more extended accumulation of accurate and officially classified construction records, there is a clear tendency to more consistent and liberal recognition of overhead costs. Where estimates of such costs are based upon extended actual construction experience they should naturally have greater weight than when taken from other appraisals, handbooks, and like second-hand sources applicable to unknown conditions.

Administration and Legal.—This item covers the salaries and expenses of the administrative, clerical, and legal staff during the period prior to operation, including general supervision of the construction work, preparation or review of contracts, accounting for and analysis of construction costs, and other incidental activities. Allowances for these costs are ordinarily between 1 and 2 per cent.[1]

Engineering and Supervision.—This item includes detailed surveys of the property, plans for the necessary buildings, designs and specifications for apparatus, equipment and other facilities, field engineering, detailed supervision of the construction, and final tests of apparatus to insure its conformity to specifications. Allowances for such services depend upon the character of the work and the extent to which detailed plans, specifications, and supervision are required.[2] It is not unusual to have certain parts of a complete utility system, such as rolling stock and sometimes underground construction, handled directly through the company's organization, employing consulting engineers only for the more complicated parts of the work. This usually means higher percentage fees for the consulting service than if the entire work were included in an engineering contract. Refinement in allow-

[1] *Re Grafton County Electric Light & Power Co.* (N.H.), 100 Atl. 668; P.U.R. 1917 E, 345; *Stockton Terminal & Electric Railway Co.* (Cal.), 2 C. R. C. R. 777.

[2] *Re Springfield Gas & Electric Co.* (Ill.), P.U.R. 1916 C, 281, 340.

ances for engineering are sometimes sought by classifying the property into different groups, assigning to each a suitable percentage. Such procedure may or may not result in a more accurate estimate of the cost of engineering for the property than if a composite percentage were applied to the whole. Allowances for engineering and supervision ordinarily lie between 3 and 10 per cent, with 5 per cent as a common estimate for a complete composite property.[1]

Although the fees charged by consulting engineers for their services vary with their ability and reputation, efforts looking to standardization have recently been made, as had previously been done for architects. In 1923 the American Institute of Consulting Engineers adopted a code of ethics in which certain minimum fees consistent with the standing of the profession were embodied, as set forth in the following extract from the code:

> For preliminary examinations, surveys, studies, plans, and reports on new projects or for review, study, and report on projects previously dealt with by other engineers, from 1½ per cent to 3 per cent or more, upon the estimated cost of the work, depending upon the character and importance of the services rendered. If, in addition to this, the services include investigations, plans, and specifications necessary to enable contractors to submit definite tenders for construction, from 2½ to 5 per cent or more upon the estimated cost of the work. If, in addition to this, final working drawings, specifications, and advice are required and also consultation and general advice during construction, from 5 per cent to 7½ per cent or more upon the estimated cost of the work. If full professional services are required, including the awarding of contracts, construction management, testing of materials, inspection work, responsibility for the organization and management of the work and carrying it to completion, from 10 per cent to 12½ per cent or more upon the actual cost of the work.
>
> The range of percentage charges contemplates differences in the magnitude and difficulties of the work, the lower percentages applying to work of considerable magnitude costing from $1,000,000 to $2,000,000 or more and comparatively free from complexity, the higher percentages to less expensive and more complex projects, the percentages to be computed upon the entire cost of the completed work exclusive of engineering or upon the estimated cost pending execution or completion, the cost of the work referring only to such part of the project as the engineer may be engaged to deal with in any of its stages.

Insurance and Damages.—This item covers either direct costs or premiums on insurance policies which protect the owners

[1] *Re Washington & Maryland Railway Co.* (D.C.), P.U.R. 1915 B, 558; *Re Consumers Electric Light & Power Co.* (Mo.), P.U.R. 1915 A, 956; *Re Glen Cove Gas Co.* (N. Y.), P.U.R. 1921 A, 211.

from loss through personal injuries or damage to property by accident, fire, or other causes. Insurance on materials in transit is sometimes included in this item. One-half to one per cent is ordinarily sufficient to cover these costs.[1]

Taxes.—Taxes on property prior to its operation depend upon the length of the construction period and the practices of local tax authorities with respect to assessments. Real estate, which must ordinarily be acquired first, is subject to taxation by the purchaser as soon as acquired. Buildings and equipment may not be taxed until a particular assessment date on which substantial progress of the work toward completion is evident. Tax allowances range from less than 1 to something like 3 per cent.[2]

Interest.—There is also a wide range in provision for interest prior to operation, depending upon the length of the construction period and the character of the financing program. It is sometimes expedient or necessary to assemble all construction funds before work is begun, unused funds being deposited in a bank subject to interest at moderate rates. Under other market conditions investors or bankers sometimes furnish construction funds on the instalment plan as needed or under a stated schedule which does not involve large unused accumulations. The latter procedure, in an entirely new project, such as a cost-of-reproduction appraisal assumes, is not ordinarily feasible. Bankers who are to furnish the funds prefer to meet their obligations promptly without incurring risks which changes in market conditions might involve.

It is common practice to assume interest at a rate somewhat below the fair return rate for a going property for a period equal to one-half of the entire construction period.[3] Where a large investment in land is made in advance of construction and carried throughout the entire period, together with instalment payments on equipment costs, payrolls, etc., detailed schedules of construction payments and advances and interest credits thereon to date of completion are sometimes prepared. For a large property, such as a railway system, it is sometimes urged that interest should not be allowed during the entire construction period on the assumption that important parts of the property can be

[1] *Magnum Electric Co.* (Okla.), P.U.R. 1916 E, 764, 771.

[2] *Re Watts Engineering Co.* (Mo.), P.U.R. 1915 B, 921.

[3] *Re Mountain States Telephone & Telegraph Co.* (Colo.), P.U.R. 1917 B, 198.

completed and put into operation some time before the entire completion of the project and final payments therefor. Such partial operation would ordinarily be good business judgment, but it does not necessarily follow that the parts of the property so operated under experimental and other adverse conditions would yield sufficient revenue to pay their carrying charges.

It has, on the other hand, been proposed that this item of interest should be designated as "Interest Prior to Successful Operation" and include failure to earn a return on the investment either before or after the completion of the construction and until the property is able to pay its way. Ordinarily, however, failure to earn a return after the property has been completed has been provided for, if at all, under the heading of "Going Value," which will be discussed later, although the distinction between failure to earn a return prior to operation, when such return is wholly lacking, and immediately following such operation, when it is rarely, if ever, possible to earn an adequate return, is not clear. Allowances for interest commonly lie between 3 and 7½ per cent, with a normal allowance in the vicinity of 5 per cent.[1]

Financing.—The propriety of including financing costs as an element of value has repeatedly been questioned, primarily on the theory that such costs should be amortized over a period of years, thus removing the item from value and placing it among the items which make up the annual return on the property. It is true that standard accounting classifications require that discount on and selling expense of bonds and other obligations shall be amortized uniformly during their life, with a provision, however, that that part of the amortization falling within the construction period may be capitalized. No such provision exists to take care of brokerage on stock issues, which issues may constitute one-third to one-half the total financing, and which require a rate higher than that on bond issues because of the greater sales resistance and risk encountered.

Many valuation decisions fail to distinguish between discount and brokerage, the former being the difference between the par value and the price which the ultimate investor pays to give him the yield which he demands under the circumstances. Such discount is, therefore, clearly a function of the rate of return

[1] *Re Philadelphia Rapid Transit Co.* (Pa.), P.U.R. 1923 E, 190; *Re Public Service Railway Co.* (N. J.), P.U.R. 1921 D, 593; *Re Beaver Valley Water Co.* (Pa.), P.U.R. 1916 E, 962.

which is not a factor in valuation. Brokerage, however, covering the fees which the bankers charge for their services in procuring money for construction purposes, has nothing to do with the rate of return to investors and is confused with discount primarily because the bankers' fees or commissions are provided through the difference in price at which securities are purchased from the utilities and that at which they are sold to investors.

For example, an issue of bonds may be sold by a utility to its bankers at 90 and purchased from the bankers by investors at 95. The investors' 5 per cent discount is fixed by the yield which they demand. The remaining 5 per cent is the bankers' commission for procuring the required funds for the utility. Although that part of the brokerage assignable to obligations may as an accounting matter be amortized, the part applicable to junior securities is not so amortized for lack of a definite period of amortization. For purposes of a rate case it is not necessary to divide financing costs between amortization and value, but the case will be simplified by treating financing cost as an element of value and entirely omitting amortization provisions from the rate of return, as would otherwise be necessary. The result in the long run will be the same in either case. That this is so is illustrated below in connection with other overhead costs. Many decisions of commissions and courts will, nevertheless, be found which wholly exclude financing costs from valuation on the grounds already stated. The United States Supreme Court has held that "hypothetical" brokerage should be excluded.[1]

Financing costs for an entire project, as distinct from recurrent additions to capital, usually amount to not less than 5 per cent. In many well-known cases of established corporations 10 per cent has been paid in recent years, although such percentage should ordinarily be considered as high except for new properties and those with which investors are not acquainted. These percentages assume that the security issues involved are sold outright by the utilities to bankers who assume all the risks of sale as well as the selling services and expenses.

Supplies.—The need of materials and supplies with which to carry on current operations and repairs is undisputed. Public utilities do not make careful distinction between operating supplies and those normally carried for routine construction requirements. In a cost-of-reproduction appraisal construction

[1] *Re Galveston Electric Co.*, 258 U. S. 388, 397; P.U.R. 1922 D, 159.

supplies should not be included if sufficient allowance for interest during construction has been made. On the other hand, a valuation based on investment does not make allowance for such supplies, and the entire supply requirements should be included. Ordinarily, in appraisals a single item of "working capital" is set up, including both supplies and cash. Allowance for this combination is commonly made as a designated sum, a percentage of operating expenses, or a percentage of the value of the physical property.[1] Public utilities are more apt to check their actual accumulations of supplies and cash in relation to their annual revenues, and it is common experience to find an average amounting to between 20 and 25 per cent of such revenues.

Methods of Application.—The above discussion has assumed that provision for the various physical overheads would be made as a percentage of the structural cost of the property. This is the usual procedure, although in some cases certain overheads have been worked out in dollars based on schedules of services, deliveries, etc. The percentage method has its advantages if based upon actual experience of construction done under similar circumstances. All large construction organizations develop such percentages from an analysis of their work, and they are more reliable than other bases of estimating. Some appraisal engineers apply their overheads successively, arranging them in chronological order, with contingencies first, then insurance, engineering, etc., with interest and financing as the final percentages applying to the preceding overheads as well as to the structural cost. This is a logical procedure but may not lead to any greater accuracy in the final valuation.

Where the percentages used are based upon actual experience, as they should be, they should follow the practice in the actual work on which they are based. If, as is usually the case, each class of overhead costs on construction projects is worked out as a percentage of bare structural costs, the appraisal overheads should be similarly applied and not successively. If, for interest, financing, and kindred items, the supporting data are based upon the amounts directly involved, the appraisal percentage should be applied in a similar manner.

Difficulties are sometimes encountered in attempting to apply the experience of public utilities themselves in determining suitable overheads. It may appear that such overheads as

[1] *Re Mobile Gas Co.*, 293 Fed. 208; P.U.R. 1924 B, 644, 656.

administration, engineering, taxes, interest, etc., have not been specifically assigned on the accounting records to routine construction work but, rather, have been included in operating expenses. Decisions of commissions frequently state that certain overheads will not be allowed because they have been charged in operating expenses. Such charge does not necessarily mean that the public has really paid the bill currently, for many cases exist where not only the overhead expenses in question but others have been paid at the expense of investors because of inadequate revenues and dividends. Even if, with such charges to expense, investors have had a fair return, it does not follow that such items are properly excluded from the rate base inasmuch as they are recognized elements of value which actually exist in the property. The following figures from an assumed case will show that nothing is gained by excluding these incidental charges from the rate base:

The assumed property regularly spends 30 per cent of its annual revenues for new construction. Two per cent of the revenues have been and are being included in operating expenses through failure accurately to analyze and charge construction costs. During a 20-year period, which is sometimes assumed to be the normal useful life of public utility property, 40 per cent of the annual current revenues would have been incorrectly included in operating expenses. This 40 per cent of the annual revenues is also 10 per cent of the average investment or, with a steadily growing property, not more than 6 per cent of the present investment. If the requirements for fixed charges amount to one-third of the annual revenues, this 6 per cent of the present investment absorbs 2 per cent of the present revenues. If, therefore, all past construction costs had been properly charged, and overhead allowances made accordingly, present fixed charges would be increased by this 2 per cent of the revenues, and operating expenses would be reduced by the same 2 per cent (or, if further analysis is warranted, by whatever charges of that character are currently being included in expenses), leaving the total cost of service to be covered by rates substantially unchanged. The question of how these incidental overheads were actually charged properly arises only in connection with determination of actual investment, and is significant then only in cases of excessive past profits and abnormally high or low present construction overhead charges in operating expenses.

Promotion.—We come now to a consideration of the so-called non-physical overheads, first among which is promotion. This item is often excluded in findings of fair value on the ground that the promoters of public utility projects are paid for their services with so-called "bonus" stock, which has been discussed in a preceding chapter, or are suitably rewarded through construction contracts or related real estate transactions, or otherwise; or that promotion service in connection with the cost of reproduction of an already successful property is illogical, or that there was no evidence of actual promotion service of value to the property or the community.

To one familiar with the inauguration of large projects it is clear that they do not materialize spontaneously. On the one hand is a field ripe for development; on the other hand, a scattered group of investors with no knowledge of the possibilities of this field. The promoter is the entrepreneur who discovers the field with its latent possibilities and presents it to the investors for consideration. This field is first carefully canvassed by engineers, who study its revenue possibilities and the necessary investment to produce the revenue. Attorneys are also employed to study the legal situation with respect to franchise terms, regulatory practices, political conditions, and unfavorable general restrictions. The general business characteristics and prospects of the territory and its surroundings are also carefully surveyed by the promoter and his associates.

Finally, if no insurmountable obstacles are encountered and the necessary rights to do business can be secured on an acceptable basis, a prospectus of the whole situation is prepared and submitted to one or more investment banking houses, through which investors might be attracted. If the bankers find the prospects sufficiently favorable to interest investors in sufficient numbers to insure the assembly of the required funds, the necessary arrangements thereto are perfected.

The procedure above outlined involves expenditures for services of the promoter himself and his engineering, legal, and other advisers, and some margin for possible losses of the promoter and his associates in projects of this kind in case no bankers are found who are disposed to finance them. Although, as stated, many valuations omit allowance for these necessary costs, others include them to the extent of 5 per cent or more.[1] An analysis of

[1] *Re Rochester, Corning & Elmira Traction Co.* (N.Y.), 1, N.Y.(II) P.S.C. R., 166, 177; *Re Peaks Island Corp.* (Me.), P.U.R. 1917 E, 750.

a number of typical promotion and organization programs discloses actual legal and other costs, but without payment for promotion services, varying from 6 to 10 per cent.

Organization.—It is next in order to incorporate the project with sufficient authorized capital to cover its original cost and provision for future expansion, necessitating the further services of attorneys, fees for incorporation, and other incidentals, including the acquiring of necessary franchise and other rights or the taking over and perfecting of such rights already acquired by the promoter. Having thus been incorporated, the project is then ready to proceed with physical construction, which has already been considered. The allowances for organization services and expenses are often combined for convenience with administration and legal, included in the physical group, and an allowance of 2 or 3 per cent for the combination is not infrequent.[1] Promotion is also sometimes included in this group with an appropriate increase in the allowance.

Working Cash Capital.—This item has already been referred to above in connection with supplies. It is sometimes contended that railway companies, because of their advance collection of revenues, do not require working cash capital. There is undoubtedly a difference between the requirements of such companies and of electric or gas companies, which collect their revenues thirty days after the service has been performed. It is, nevertheless, true that railways find it necessary to carry large quantities of supplies, equivalent ordinarily to about one month's revenues, and to maintain substantial amounts of cash in excess of current collections to provide for contingencies such as prompt settlement of serious accident claims, and, in common with other kinds of utilities, to maintain bank balances sufficient to permit them to borrow for temporary financing. It has, therefore, been the common practice of commissions to make moderate allowances for cash, in connection with allowances for supplies consistent with actual requirements as shown by supply account records.[2]

As previously stated, 20 to 25 per cent of the annual revenues is usually required by public utilities to cover supplies, cash, and the excess of accounts receivable over accounts payable. Some commissions prefer to use a percentage of the value of the fixed

[1] *Re Chesapeake & Potomac Telephone Co.* (W. Va.), P.U.R. 1921 B, 97; *Re Consumers Electric Light & Power Co.* (Mo.) P.U.R. 1915 A, 956.

[2] *Re Duluth Street Railway Co.* (Wis.), P.U.R. 1923 D, 705, 715.

assets, ranging from 4 to 8 per cent,[1] or an allowance based on revenues or operating expenses usually one to two months' requirements,[2] depending upon the character of the business done. These latter allowances may provide for cash requirements only, supplies being added at reasonable inventory value.

Riparian Rights.—In connection with hydroelectric developments, the question arises as to the value of the rights to the water necessary for the development as distinct from the cost of the physical property. That there is value in such rights cannot be questioned because through them it is possible to furnish electric service to customers within the limits of economical transmission at lower cost than from steam or other alternative source. Any productive process which lessens the cost of commodities as compared with other processes has such a distinct value. In the case of mechanical processes and devices this value belongs exclusively to the inventor or holder of the patents issued therefor for a term of years, and an appraisal of the property would properly include a distinct value for the patent rights, which value would be determined by a consideration of the net saving resulting from the exercise of these rights over competitive processes for producing the same commodity.

The exclusive ownership of riparian rights is not usually thus fully recognized. It is contended that falling water is one of nature's bounties, the advantages of which should not be taken away from those within its reach. On the other hand, it is contended that potential water powers have remained undeveloped for many years by those who might naturally use them, and such use has come about only through the energy, skill, and resources of others who should, therefore, reap the advantages. To the limited extent that authoritative opinion has been developed with respect to the riparian values which may be claimed by those who develop them, it appears that the owners should include in their rate base not less than 50 per cent of the appraised value, the balance of this value attaching to the territory served, which thus benefits to the extent of not more than one-half of the saving between power so developed and that from other available sources. As a legal matter, it is not clear that the owners of riparian rights can be required to surrender any part of the value

[1] *Re Mobile Gas Co.*, 293 Fed. 208; P.U.R. 1924 B, 644, 656.

[2] *Re Peoples Gas & Electric Co.* (N. Y.), P.U.R. 1924 B, 229, 246.

attaching thereto, but public policy often dictates the partial waiving of legal rights. As a matter of fact, the energy from hydroelectric plants is sold voluntarily at rates lower than those possible from alternative power sources, thus indicating that owners do not always seek to take full advantage of their legal rights.

Although the methods of determining the total value of riparian rights are not clearly defined, the most common procedure is to determine the total cost of delivering hydroelectric service from the water power in question, exclusive of the value of its riparian rights, and the similar cost of delivery from the most economical substitute source of power.[1] The capitalization of the difference between the two costs represents the value of the riparian rights. The cost of hydro service must, of course, include fixed charges and operating costs not only of the hydroelectric development but also similar charges and costs upon transmission lines, substations, etc., to the logical point of distribution of the power to available customers. In some cases the alternative power would be steam or internal-combustion engines; in others it might be hydroelectric developments less advantageously located.

That water powers have a value in addition to the cost of their physical construction is indicated by the charges made by the United States for hydroelectric plants constructed at the expense of the licensee in connection with irrigation projects or elsewhere on government domain. The Rules and Regulations of the Federal Power Commission, issued in 1921, provide for a normal annual charge of 25 cents per horsepower of installed capacity.

Franchise Value.—The value of the franchises under which public utilities operate is no longer a prominent issue. When profits from operations under a franchise were unrestricted, the franchise may have had substantial value, but under regulation, which limits profits to those obtainable from competitive business with similar risks, the value of the franchise disappears. It is, therefore, not customary in appraisals to make allowance for such value for regulated properties in excess of the reasonable costs of acquisition, ordinarily consisting of administrative and legal services. Occasionally, outright payments for the franchise itself, or annual payments in one form or another, are demanded. These must be provided for through direct inclusion in the cost

[1] *Re San Joaquin & Kings River Canal & Irrigation Co.*, 233 U.S. 454; *Re Rhinelander Power Co* (Wis.), P.U.R. 1915 A, 652.

of service or by capitalization at the authorized rate of return. In a few cases franchise values have been established through consolidations or purchase by legislation or court proceedings, and values so established have been successfully defended.[1]

Franchise value and good will have sometimes been confused. To the extent that good will consists in maintaining a clientele who prefer to patronize the "old stand" rather than possible competitors, it obviously has no place in public utility valuation, at least where monopoly operation exists under regulation. It might be urged that a large and increasing proportion of public utility business, particularly electric power and gas, must meet competition from private plants which their large customers might install, and that the securing and retaining of this service involves business skill and the confidence of the customers, which have a "good-will" value. This point has, however, not been given serious attention in the many decisions of commissions and courts which have excluded franchise values in excess of cost.

Going Value

Of all the overheads entering into public utility valuations going value is least clearly defined and most subject to controversy. It is often contended by those not familiar with the history and operations of public utilities that going value is not only intangible and elusive but has no valid claim to recognition in addition to the overheads already discussed. It is also sometimes confused with good will, which, as stated above, is not ordinarily recognized as an element of value.

For present purposes going value may be defined as the difference in value existing between a plant in successful operation and a similar plant assembled but not yet functioning. The latter plant was aptly characterized by the late Justice Lurton as the "bare bones" of the enterprise.[2] It is an uncontroverted fact in general business that a successful operating enterprise can be sold at a higher price than one which has not yet acquired either patronage or reputation. The extent of the going value in such a business has some relation to its stability and profitableness, and this value cannot readily be segregated from the value of the physical plant and other assets. It is obviously impossible

[1] *Consolidated Gas Co. vs. Willcox*, 212 U.S. 19.
Omaha Water Works vs. Omaha, 218 U.S. 180.

to measure the going value of a public utility in a similar way because it involves existing and prospective rates which may be in question.

In spite of the obvious difficulties in determining the going value of public utilities as distinct from their other elements of value, this element has had reasonably consistent recognition from courts and commissions. This recognition may be illustrated by the following quotations from leading cases, to which should be added reference to a very comprehensive list of early cases that discuss this element, to be found in *Public Utilities Reports* 1915 B, 639.

COURTS

That there is an element of value in an assembled and established plant, doing business and earning money, over one not thus advanced, is self-evident. This element of value is a property right, and should be considered in determining the value of the property, upon which the owner has a right to make a fair return when the same is privately owned although dedicated to public use. (*Des Moines Gas Co. vs. City of Des Moines*, 238 U.S. 153; P.U.R. 1915 D, 577, 584.)

It takes time to put a new enterprise of any magnitude on its feet, after the construction work has been finished. Mistakes of construction have to be corrected. Substitutions have to be made. Economies have to be studied. Experiments have to be made, which sometimes turn out to be useless. An organization has to be perfected. Business has to be solicited and advertised for. In the case of a gas company, gratuitous work has to be done, such as selling appliances at less than a fair profit and demonstrating new devices to induce consumption of gas and to educate the public up to the maximum point of consumption. None of those things is reflected in the value of the physical property, unless, of course, exchange value be taken, which is not admissible in a rate case. (*Re Kings County Lighting Co.* (N. Y. Ct. of Appeals), 210 N.Y. 479, 492; 104 N.E. 911.)

An established railroad system may be worth more than its original cost and more than the mere cost of its physical reproduction. It has passed the initial period of little or no return to its owners which, of greater or less duration, almost always follows construction and is not infrequently marked by default and bankruptcy. The inevitable errors in its building which finite minds and hands cannot avoid have been measurably corrected, time and effort have produced a commercial adjustment between it and the country it was intended to serve, relations have been established with patrons, and sources of traffic have been opened up and made tributary. In other words, the railroad, unlike one newly constructed, is fully equipped and is doing business as a going concern. It has attained a position after many experiences common to railroad enterprises which entail loss and cost not paid from current earnings, and which correspondingly make for value. (*Missouri, Kansas & Texas Railway Co. vs. Love*, 177 Fed. 493.)

The element of value which is the subject of serious contention between the parties to this litigation is what is known as "going value." In view of the settled law on this subject the question is no longer open to discussion. That a going concern has a value over and above the value of the physical property employed is self-evident. From the nature of this element of value it cannot be arrived at with mathematical accuracy, but must necessarily be considered in the light of the facts of each particular case. (*Re Springfield Gas & Electric Co.* (Ill. Sup. Ct.), 125 N.E. 891; P.U.R. 1920 C, 640, 653.)

The fact that customers have been secured is an element of value to be reckoned. It may be that in the past this labor has been charged under operating expense, but it is an asset of the property even if the service was given. (*Re Grafton County Electric Light & Power Co.* (N. H. Sup. Ct.), 100 Atl. 668; P.U.R. 1917 E, 345, 352.)

It takes time, labor, and money to bring a new operation into an efficient working organization, and to acquire a paying business. The time and money expended in the promotion of the enterprise, the cost of securing and retaining customers, the loss of earnings on a reasonably well-developed plant during its initial years, when its business is being built up, the increased value which comes from the consolidation of separate plants into one concern,—these items, with the value that inheres in a plant with its business established, may be termed going-concern cost or value. (*Re Ohio Valley Water Co.* (Pa. Sup. Ct., P.U.R. 1918 A, 161, 172, 173.)

COMMISSIONS

Alabama.—It is obvious to the Commission, and we believe that the courts have held, that a going concern has a value over and above that of its inventory value. Eliminating, however, any decisions on the subject by the courts, and looking at the matter purely as a business proposition, it is perfectly clear that anyone who desired to purchase a telephone plant would give more for a plant that was a going concern with an attached business, and developed earning power, and an efficient organization, than he would give for the mere physical property without a subscriber, without an organization, and without any earning of money. It is worth more. (*Re Southern Bell Telephone & Telegraph Co.*, P.U.R. 1919 B, 791, 794.)

California.—That there are certain actual costs incurred in developing the business during its early stages, for which costs the utility is entitled to be reimbursed, just as clearly as it is entitled to a return on the physical portions of its plant, seems to be too obvious for argument . . . I am of the opinion that such costs, legitimately and wisely incurred, should be taken care of in some way, but the exact method to be pursued, and the extent to which consideration should be given to such items, will depend upon the facts of each particular case. (*Re Palo Alto Gas Co.*, 2 C.R.C.D., 300, 310.)

Indiana.—Every effort, honestly put forth, every dollar properly expended, and every obligation legitimately incurred, in the establishment of, or in the building up of, a public utility business, should be taken into consideration in fixing the valuation for rate-making purposes. (*Apple vs. City of Brazil*, P.U.R. 1915 C, 561, 571.)

Maryland.—But in the case of a public service corporation, or an individual engaged in the public service, the situation is different. The capital has been invested, the business started, the early losses incurred, and then, when the proprietor is about to reap the benefit of success and recoup such losses, the state steps in and tells him that all he can rightfully exact from the public is a fair and reasonable return upon his investment, the precise rate depending largely upon the future, rather than the past, hazards of the enterprise.

How, then, is the proprietor of such enterprise going to recoup such early losses? Obviously the answer is that if the state is going to take this position and the proprietor has not previously recouped such losses, the state should regard them as one of the incidents of the cost of establishing the business, and, capitalizing them, permit the owner thereafter to earn upon the same. (*Re Chesapeake & Potomac Telephone Co.*, P.U.R. 1916 C, 925, 994, 1000.)

New Jersey.—The "going-concern value" will then be largely represented by the cost of developing the business as distinct from the cost of securing the physical structure. This going concern value may include the cost of soliciting business, cost of advertising, cost of inducing consumers to take service, cost of exhibiting appliances, cost of occasional free installation, and also the dearth of adequate returns during the early developmental years of the company. Depreciation unearned in this period may also sometimes be included in "going-concern value." (*Re Public Service Gas Co.*, Passaic, Dec. 26, 1912, confirmed by Court of Errors and Appeals, 94 Atl. 634; P.U.R. 1915 E, 251.)

Oregon.—A suitable estimate of the cost of development, representing the probable shortage which would now be incurred upon the investment represented by reproduction cost new, after the completion of the plant and pending its business reaching the proper stage of development, has been included with the reproduction-cost-new statement before made. (*Campbell vs. Hood River Gas & Electric Co.*, P.U.R. 1915 D, 855, 882.)

Regulatory Law Provisions.—Reference may also be pertinent to the public utility laws of several states, which require the commissions to recognize going value in their valuation proceedings.[1] The Pennsylvania law requires the Commission to consider, among other factors, "the developmental or going-concern value of such public service company." The Washington law requires the consideration of "the time elapsing between completion of construction and payment of dividends." The Indiana law requires the commission to "give weight to the reasonable cost of bringing the property to its then state of efficiency."

Elements Involved.—Two more or less distinct groups of items are commonly considered in appraising going value: (1) costs

[1] *Pa. Stat.* 1913, *No.* 854, *Art.* 5, *Sec.* 20*a*; *Wash. Stat.* 1911, *chap.* 117, *Sec.* 92; *Ind.* Pub. Utl. *Law*, *Sec.* 9.

of assembling an operating organization and acquiring business; and (2) deficits incurred in the early operating or development period of the property, sometimes called "development cost." These two groups of items, both representing costs, have been given various weights, distinct recognition having been denied to either one or the other in many cases. The second group, covering deficits in operation, may in part include the initial costs set up in the first group, although to a large extent these initial costs precede actual revenue operations.

Cost of Establishing Business.—It will be of interest to examine these initial business costs in further detail as to their character and extent. After a property has been assembled, tested, and pronounced in operating condition by its engineers, it cannot at once commence to yield revenues. An operating organization must first be procured and trained for various operating functions. A new power plant cannot be depended upon to deliver continuous and efficient service until the staff of employees has become thoroughly acquainted with its complicated mechanisms and learned to perform both routine and emergency functions with assurance and without risk of damage to costly apparatus or of interruption of service. High efficiency of operation, particularly in connection with boiler plants, is secured only after extended experience. Not only must power stations and similar apparatus be operated under trial conditions before service is actually sold, but such other operations as rapid transit car lines and even important surface lines must be conducted under trial conditions before the responsibilities of revenue traffic are assumed. Service employees of the grade involved in the above operations are in turn selected by supervisory officials who must, therefore, be employed a considerable time in advance of regular service. Car schedules adequate for existing traffic, but not too liberal, can be developed only after costly experiments and accumulations of data.

Accounting and clerical forces must also be assembled in advance of revenue operations and trained in the handling of their work, including meter reading, billing and collection practices, operating data, etc. Practically the entire operating organization must, therefore, be employed for appreciable though varying periods in advance of regular service.

In addition to the above is the necessary work of the new business department which is responsible, particularly in electric

and gas companies, for the selling of service. The new business activities include advertising, correspondence, solicitation (largely through house-to-house canvassing), demonstrations and trial installations of appliances, services of illuminating and power engineers, and other kindred activities incidental to the education of the public in the advantages of the service offered. As already stated, a large proportion of these activities are necessary before any service is rendered, and practically all before revenue begins to flow in. The total of such costs, based upon estimated organization requirements or actual experience, has been frequently found to lie between 5 and 12 per cent of the investment in physical property.[1]

Development Cost.—The so-called development costs, which are almost invariably incident to the early years of any public utility, can be accurately determined where complete accounting records are available, and many studies of this character have been made. Where accounting records are incomplete or not wholly above suspicion, they may often yield approximate data from which development cost estimates can be made. It is sometimes contended that the computation of early losses should not be extended beyond a few initial years, on the theory that the company will get on its feet within that time if the project was justified when undertaken. Such contention is not always justifiable regarding property in a rapidly growing community where extensions of track or underground construction that are bound to be temporarily unprofitable are insistently demanded. If such extensions serve to reduce the total income of the company below a fair amount, it would appear logical to treat the unprofitable extensions as separate units and allow development costs thereon.

A study of the history of public utility developments shows early losses of surprisingly large proportions even in established and growing communities where the demand for public utility service has been continuous and insistent. These losses are met through sacrifice in returns to the owners of the property. Such losses or costs of establishing business cannot be ignored in the public utility field if capital is to be secured any more than in any other business. In competitive enterprises such early losses are taken as a matter of course and are made up in later years through profits in excess of current needs. It is the general

[1] *Re Utah Gas & Coke Co.*, P.U.R. 1919 D, 645, 655.

experience in well-managed enterprises that these losses are made up and that the enterprises yield ultimately a full fair return to their investors. If such return were not earned in the early years and could not thereafter be made up, the projects would not be undertaken so long as other enterprises were available which involved no such risks.

It is, therefore, necessary in the public utility field to assure investors that their initial sacrifices will be compensated for in some way in later years. Under regulation this can be done in either of two ways. The first is by amortizing the losses, including interest thereon, from the profits of later years. This involves the allowance of a supplementary return in addition to that necessary for current requirements and, therefore, rates for service substantially higher than would be necessary without such amortization. Such higher rates in the immature years of a property serve to retard its natural expansion and the improvements in efficiency and saturation of investment which would otherwise be obtainable.

The alternative method is the inclusion in the rate base of an allowance for the development cost as going value. The advantages of this latter method lie in the lower current burdens upon customers and the possibilities of more rapid expansion of business and increased efficiency. The relative costs of capitalization and amortization are further discussed in the chapter on Accounting. As to the more strictly economic phases of the question, it may fairly be asked why the customers of a public utility should be required to reimburse it for its early losses in a few subsequent more profitable years rather than to spread the burden of these losses over an indefinite period to be participated in by all customers. The advantages of public service and its necessity in modern civilization continue indefinitely and any costs incident to the establishment of such service may fairly be spread as widely as possible. This view of going value is not modern but has been clearly appreciated since the early days of regulation. A decision of the Oklahoma Supreme Court in 1911 presents the argument in favor of capitalization of early losses rather than amortization so clearly as to justify the following quotation:

> Few industries, if any, involving an investment of $90,000 or more, can be made self-sustaining from the first day of their operation. The uncontradicted evidence in this case discloses that appellant's plant, for the years

preceding the first hearing, failed to produce revenue sufficient for operating expenses, current repair, and to lay aside an amount for depreciation. During the time of development, there is a loss of money actually expended and of dividends upon the property invested. How shall this be taken care of? Must it be borne by the owner of the plant? Or by the initial customers? Or shall it be treated as part of the investment or value of the plant, constituting the basis upon which charges shall be made to all customers who receive the benefits from the increased service-rendering power of the plant by reason of these expenditures? It seems that the last solution is the logical, just, and correct one. If rates were to be charged from the beginning, so as to cover these expenditures, and earn a dividend from the time a plant is first operated, the rate to the first customers would be in many instances, if not in all, so exorbitant as to be prohibitive, and would be so at the time when the plant could be of least service to them. On the other hand, the public cannot expect as a business proposition, or demand as a legal right, that this loss shall be borne by him who furnishes the service; for investors in public service property make such investments for the return they will yield; and, if the law required that a portion of the investments shall never yield any return, but shall be a total loss to the investor, capital would unwillingly be placed into such class of investments; but the law, in our opinion, does not so require. Private property can no more be taken in this method for public use without compensation, than by any other method. When the use of the property and the expenditures made during the non-expense-paying and non-dividend-paying period of the plant are treated as an element of the value of the property upon which fair returns shall be allowed, then the burden is distributed among those who receive the benefits of the expenditures and the use of the property in its enhanced value.[1]

This method of determining going value was first used in rate cases by the Wisconsin Commission, and its decisions in the *Antigo Water* case in 1909[2] and in the *Madison* case later in the same year[3] describe the method adopted by that Commission. In general, this method provides that in each year the actual income available for return to investors shall be compared with the amount necessary to yield a fair return on the existing rate base, and the deficiency, if any, added to the rate base of the succeeding year. This process requires the determination not only of the current revenues, expenses, and taxes, but a suitable provision for retirements and the fixing of a fair percentage of return upon the rate base.

[1] *Pioneer Telephone & Telegraph Co. vs. Westenhaver*, 29 Okla. 429; 118 Pac. 354, 360.

[2] 3W.R.C.R. 623.

[3] 4W.R.C.R. 1.

It is sometimes contended that allowances for losses resulting from errors or inefficiencies in administrative and operating methods which reduce revenues or increase costs should not be included in going value. This contention can be answered by the statement that public utilities should be privileged to make the same mistakes and operate with the same lack of perfection as are encountered in other business, but should not in these respects fall below the normal commercial standard. It might be claimed that a lower standard should be accepted from regulated monopolies, since in the alternative unregulated and competitive business the market prices of product are based not upon the cost of production of the most efficient manufacturers but on costs, necessarily much higher, of the so-called marginal producers, the output of which is demanded by the public. It is unnecessary, however, to argue this latter point, because public utilities generally pride themselves upon their high average efficiency and business judgment and do not seek relief from responsibilities for other than ordinary errors of operation or administration. That part of public utility rates necessary to cover the difference between perfect and actual operations is believed to be smaller than that commonly existing in other business.

Illustrations of Actual Experience.—As a further illustration of development cost, some actual figures from representative properties may be of interest. It is difficult to secure a wide range of reliable data on actual investment and income going back to the inception of such projects because of incomplete or unstandardized accounting records. Comparatively few new projects have been undertaken under modern accounting and supervisory methods. The following cases meet these conditions to a suitable extent:

Case A.—An interurban railway, built between two developed, progressive cities, with traffic available from the beginning. Careful engineering and traffic surveys were made in advance of construction. The net income available for investors in the early years in per cent of the actual cash investment was as follows:

First year	2.8
Second year	4.7
Third year	5.0

In the following years casualties and other disturbances interfered with the orderly development of the business which

would otherwise have become profitable with cumulative losses, without interest allowance, amounting to about 13 per cent. It is to be noted that the circumstances in this case were very favorable to early profitableness.

Case B.—A city street railway system, originating with horse cars (which fully recouped their early losses), succeeded by electric cars which showed cumulative losses amounting to 21.5 per cent before profitable operation was assured.

Case C.—A combined railway, electric, and gas system, begun in a small city under inefficient local management with unsatisfactory service; later purchased by outside interests, rehabilitated, and extended. It took the rebuilt system seven years to develop a profitable business. The distributable income in early years was as follows:

	Per Cent	
First year	1.2	
Second year	3.9	
Third year	4.6	
Fourth year	5.5	
Fifth year	5.2	(business depression)
Sixth year	4.9	(business depression)
Seventh year	7.4	
Eighth year	8.5	

The cumulative losses under a normal return to investors were more than 25 per cent.

Case D.—A large hydroelectric system built in a developed industrial section, with an attractive volume of initial business but with necessarily large investment for future growth. Deficits in successive years under a fair return for such a project were the following percentages: 4.3, 4.1, 4.0, 3.2, 2.7, 2.6, 1.3, 2.0, 1.7, 0.9. The sum of these deficits, with interest allowances thereon, is about 35 per cent of the cash investment.

The above cases involve conditions more favorable for prompt business development than the average encountered in public utility experience. Electric companies, and many gas companies, have probably been more fortunate, although their early history is difficult to trace in many cases. Railways, as a rule, have shown slower development with higher cumulative losses, amounting in many cases to over 30 per cent, and sometimes to as much as 50 per cent of the investment in physical property.

It is not unusual in historical studies of certain classes of utilities, particularly electric companies, to find that early losses

have been largely or wholly offset by subsequent earnings in excess of the normal fair return. In the absence of regulatory restraint, the cumulative deficits may not only disappear but may be replaced by a surplus. It has sometimes been claimed that such a surplus accumulated in excess of a fair return should be used to reduce the rate base on the assumption that the addition of development cost to investment is an algebraic process. This contention has not been upheld in the cases, as shown by the following quotation from the *Passaic Gas* case decided by the New Jersey Court of Errors and Appeals in 1912:

> We cannot equitably project back into the unregulated past a norm of prices that might today be regarded as fair and adequate, and assume that actual rates exacted in the past, in so far as they exceed what are now deemed fair, have not lawfully become the property of the company. If these high rates in the past have been employed by the company to acquire an intangible property in the shape of extensive patronage, that expectation of patronage is theirs, and on its fair value the company is entitled to a return. It may or may not be a subject of regret that regulation was so long deferred; but deferred regulation is no excuse for refusing at present to allow a fair return upon what is the lawful property of the company.[1]

Even when development cost is absent and no addition to investment is appropriate on that account, there may still remain the element of value arising from the fact of an attached and going business.

Capitalization of Initial Risk.—Another simple and logical method has been employed for determining the value of an established business, without, however, definitely distinguishing the source of this value as between cost of acquiring customers and an efficient organization and other costs of developing a profitable business. This method is based upon the difference in risk, as measured by difference in rate of return demanded by investors, from a new and untried property and one which has acquired a stable and profitable business. This difference in required yield due to difference in risk between new and established properties is substantial, as disclosed by market quotations on their securities. While it is difficult definitely to segregate this risk factor, it usually exceeds 1 or perhaps 1½ per cent. The capitalization of the difference in return required under the two rates gives an amount ordinarily lying between 10 and 20 per cent of the value of physical property, which is the

[1] 87 Atl. 651. See also *Re Garden City Telephone, Light & Manufacturing Co.*, 236 Fed. 693; *Newton vs. Consolidated Gas Co.*, 258 U.S. 165, 175.

investor's estimate of the market value of the elimination of newness and its attendant uncertainties, and the substitution of a stable going concern.

Allowances for Going Value.—Supplementing the above statements of the principles involved in the determinations of going value, the specific allowances which have been made by commissions and courts in reported cases will be of interest. These allowances usually lie between 5 and 20 per cent of the value assigned to physical property; 10 per cent is more frequently encountered than any other allowance. Higher allowances have sometimes been made in purchase cases, and one frequently quoted rate case adopted 30 per cent, which was approved on appeal by the highest state court.[1] It should be pointed out, however, that in this case promotion, organization, legal, and other preliminary expenses were included in this 30 per cent blanket allowance. A study of the cases shows that the specific percentages selected are usually not based upon any definite computations or logical processes of reasoning, but, rather, upon the broad judgment of the tribunals. An extended list of actual allowances for going value in important cases is not here permissible, but such lists, as well as references to and extracts from opinions, may be found in the following reported cases:

Re Mountain State Telephone & Telegraph Co., P.U.R. 1923 B, 352, 366.
Re Indianapolis Water Co., P.U.R. 1923 D, 449, 502.

There has been a noticeable tendency in valuation decisions to avoid a definite separate allowance for going value, this element being included in the final determination of the rate base which involved a consideration of investment, cost of reproduction, accrued depreciation, working capital, and possibly other elements. In a few of these cases which have stated that going value had been considered and recognized, the rate base does not show sufficient margin above suitable provision for other elements of value to indicate that any real allowance for this element was in fact made. Certain of these cases have been appealed, the decisions of the commissions enjoined, and the cases remanded to the commissions for more specific and adequate allowances for going value.[2]

[1] *Re Public Service Gas Co.*, 94 Atl. 634; P.U.R. 1915 E, 251.

[2] *Re Springfield Gas & Electric Co.* (Ill. Sup. Ct.), P.U.R. 1920 C, 640, 659.

Certain commissions which have not usually made liberal allowances for going value and have held that development cost, as herein described, was not a suitable measure of such value, have given less comprehensive recognition to deficits under a fair return by permitting their prompt amortization or their addition to the rate base when and to the extent that such deficits had been incurred under regulation, or, more specifically, under rates prescribed by the commissions. The reasoning in such cases has been that where the commissions have clearly assumed responsibility for adequate revenues and have failed in such responsibility, they should undertake to insure that in one way or another the deficits are made good.

Unit Allowances.—It is of interest to note that in a few cases in which commissions have approved an allowance for going value covering the cost of acquiring business but not covering inadequacy in return from such business after it was acquired, the allowance has been determined on a unit basis—a fixed sum per customer for electric, gas, and telephone utilities—these allowances being based upon the experience or evidence of the companies involved in these cases. Such allowances have ranged from $5 to $13.25 per customer or telephone.[1] No allowances of this character have been set up in electric railway cases. Data on actual development cost of certain representative railway properties indicate amounts varying from $3,000 to $8,000 per car, or $5,000 to $15,000 per mile of track. A study of the experience over a period of years of a number of electric and gas companies in acquiring new customers shows the cost, including soliciting, advertising demonstrations, etc., to lie between $15 and $30 per customer. An interesting specific case is that of a gas company beginning business in a western city of unusually large size and, therefore, prepared to welcome gas service at a minimum cost for solicitation and other new business expense. The records of this company for its initial twelve years show an average new-business cost of $22.50 per customer.[2]

The Galveston Case.—This discussion would not be complete without reference to the case of the Galveston Electric Company, decided by the Supreme Court in 1922. The rejection in this case of going value based upon early losses has been frequently used as the basis of a denial of any allowances for this

[1] *Re Albemarle Telegraph Co.*, (Va.) P.U.R. 1922 A, 756.

[2] *Re Utah Gas & Coke Co.*, P.U.R. 1919 D, 645.

element in rate cases. Such denial is not warranted by the facts of the decision, which states:

> Going concern value and development cost *in the sense in which the master used these terms* are not to be included in the base value *for the purpose of determining whether a rate is confiscatory.* (Italics supplied.)[1]

Apparently, other evidences of going value submitted to the master in the case below were not included in the record considered by the Supreme Court.

That this decision should not be interpreted too broadly is evidenced by the statement regarding going value in another unanimous decision of the court, delivered in the following month and involving a neighboring property. In this case it was held:

> Whether going-concern value should be considered and allowed at all in determining the base for rate making, and, if allowed, what the amount of it should be, *depends upon the financial history of the company.* (Italics supplied.)[2]

The *Galveston* case was cited in support of this finding.

It is significant that a federal judge in another district, who had in a subsequent case wholly rejected going value, was led in a still later case frankly to reverse himself because of his previous misunderstanding of the *Galveston* decision. He made the following statement:

> The special master expresses the opinion that a going-concern value should be allowed, but he does not include this item in his valuation, doubtless in deference to the opinion which I rendered in the case of *Jacksonville Gas Company v. Jacksonville*, 286 Fed. 404, where I expressed my understanding that going-concern values are no longer allowable in passing upon the question of confiscation of a utility's property by the fixing of rates. This decision as applied to the facts of that case was correct, as no proof was furnished to the Court from which to find the going-concern value. At that time I construed the opinion in the Galveston case as excluding the allowance of all going-concern values, but upon further consideration of that case, in view of the subsequent decisions of the Supreme Court of the United States, I now understand the opinion in the Galveston case, *supra*, as holding, not that going-concern values are not allowable when proven, but simply that they cannot be proven and allowed upon the basis upon which the master had proceeded in that case, and that when the going-concern value is properly established by the evidence, it is allowable. This I find to be the construc-

[1] *Galveston Electric Co. vs. Galveston*, 258 U.S. 388; P.U.R. 1922 D, 159, 167.

[2] *Houston vs. Southwestern Bell Telephone Co.*, 259 U.S. 318; P.U.R. 1922 D, 793, 799.

tion which the Supreme Court of the United States has placed upon the Galveston case.[1]

The finding in the *Galveston* case that "past losses obviously do not tend to prove present value" has led to more careful attention in recent cases to evidences as to the cost and value of a developed business although evidences of early losses are still presented to and considered by the commissions which are dealing with the question of fair rather than confiscatory returns. It should be pointed out that the development cost under criticism is a cost, and, in general, cost is not exclusive evidence of the value of any property element. Therefore, with respect to going value as other elements, both cost and cost of reproduction should be presented. Development cost should logically be attached to the evidences of actual investment in physical property whether it be 5 or 50 per cent of such investment. Cost of reproduction of existing business is proper evidence of going value to be attached to cost of reproduction of the physical property. This distinction has not ordinarily been recognized in the cases.

Historical Conditions of Establishing Business.—Objection is frequently raised in valuation cases to evidence of reproducing existing business on the grounds that the assumptions made are in violation of conceivable circumstances. It is claimed that it is unthinkable that a large and prosperous city could exist without public utility service such as the reproduction method assumes, and that if an electric or gas company should be started in such a city, it would only be necessary to employ a staff of office clerks to receive applications from a throng of impatient prospective customers aware of the advantages of public utility service from the experiences of other cities.

There is occasion here for clear and logical thinking. The protestants here referred to are presumably those who in rate cases insist that paving laid subsequent to public utility construction, and other similar contested elements, shall be excluded from valuation and, to accomplish this purpose, have urged the adoption of reproduction under historical conditions. For consistency with this now generally accepted interpretation of the reproduction method, the cost of reproduction of the business should also be based upon historical conditions. This would

[1] *Re Mobile Gas Co.*, 293 Fed. 208; P.U.R. 1924 B, 644, 653.

imply comparative unfamiliarity with public utility service existing at the time much of the business was secured and the correspondingly high sales resistance, the necessity for demonstrations, trial installations, etc., which were incident to the actual development of the business.

In the preparation of their rate cases public utilities should not limit themselves to general and indefinite evidence as to going value based upon conventional allowances. They should, rather, present carefully prepared exhibits of the deficiencies in return in early years, to which investors have submitted in the expectation of their ultimate recovery in some form, as evidence of actual investment in the business as distinct from that in physical property. They should also submit evidence, including opinion testimony, covering the reasonable and probable cost of reproducing the business presently existing as a part of the cost of reproduction of the enterprise as a whole. Going value has been excluded in many cases solely because convincing evidence of its existence has not been offered, and opposition to its allowance on general principles has been forcefuly urged.

Going Value Included in Expenses.—Objection to going value is frequently raised not only on the ground that early losses, if they occurred, have already been recovered "for aught that appears in the record," but also because they have been included in operating expenses and, therefore, currently paid for by the customers. This latter contention is subject to the same comment as other elements of value which have been similarly treated in accounting routine. Value cannot be wiped out through accounting methods. Utilities will admit that physical or non-physical property, paid for through operating expense, which expense has been fully reimbursed from the revenues that customers have contributed, does not represent *investment* as that term is used herein. If some other costs of service have not all been recovered, such property may represent investment, and in any event it is an element of *value* to be included in cost of reproduction estimates. This view is sustained in many decisions, including that in the *Kings County Lighting* case, in which Judge Miller said:

. . . By the expenditure of time, labor and money, it coordinates those bones into an efficient working organism and acquires a paying business. The proper and reasonable cost of doing that, *whether included in operating*

expenses or not, is as much a part of the investment of the company as the cost of the physical property. (Italics supplied.)[1]

Going Value in Purchase Price.—It is also sometimes contended, in connection with actual investment determinations, that where such investment includes the purchase price of a going property no further allowance for going value should be made. That such a contention may not be sound was well expressed by J. E. Benton, now counsel for the National Association of Railway and Utilities Commissioners, in an address in 1916, from which the following is quoted:

> But I do not think this can be the law. If a property has been established as a going concern at an unexpectedly large but necessary expense to the owners, so that a reasonable return cannot possibly be earned upon the full investment, but there is a possibility that business may some time increase to a point where such return can be earned, it does not seem just to say to the owner "You may yourself have a return upon your full investment, but you may not convey the right to receive that return to any purchaser unless he will pay as a purchase price the full investment." The right to earn upon the full investment is a valuable attribute of the physical property, and the owner should be permitted to sell it with that attribute attached, for what he can obtain in the way of a purchase price.

Effect upon Credit.—With these evidences of going value, attaching respectively to investment and cost of reproduction, the two major bases of determining final value or the rate base are complete. There will be less difference between these two bases if, as recommended, the appropriate going-value allowance is included in each than when this element is independently determined and added to a value of physical property which may be a compromise between investment and cost of reproduction.

It is again urged that going value cannot be considered as an intangible or imaginary factor in the rate base, as is often contended. It represents a substantial, actual investment and, from a commercial point of view, involves unquestionable value. The recognition of this element has material bearing upon the successful functioning of public utilities. If early or subsequent deficits can never be recovered under regulation, the flow of new capital to the industry will be retarded, if not stopped altogether, and the additional risks thereby created will operate to increase the cost of money, the cost of service, and the rates charged therefor.

[1] 210 N. Y. 479, 492; 104 N. E. 911.

Summary of Appraisal Practice.—The above elements include those which are ordinarily considered in determining the cost of reproduction of public utility property Detailed appraisals commonly set up the physical and non-physical overheads enumerated as additions to the so-called structural value. Many appraisals also include among the overheads such items as contingencies, omissions, and general contractors' services, which have already been discussed. It is the common practice of critics of public utility appraisals to assemble all percentage items which they can designate as overheads with a view to setting up a vulnerable total of such percentages in relation to the remaining so-called tangible property. Public utility commissioners, like other human beings, are sensitive to charges of extravagant allowances even though they are convinced that the real overheads which they approve are wholly reasonable. To avoid such controversies certain commissions have adopted the commendable practice of including in structural cost all the items which can logically be so arranged, leaving only for consideration as overheads such elements of value as logically and with greater accuracy can be so considered.

The percentages of such overheads are usually applied to actual cost or cost of reproduction new, but a few cases are found in which they are applied to depreciated values. The latter practice cannot be justified where accuracy is sought. Suitable overhead percentages are only obtained from actual experience on construction work which involves *new* property. Where depreciation of physical property is assumed it does not follow that the overheads attaching thereto depreciate at the same rate, if at all, and more satisfactory results are obtained by assembling all elements of value and overhead on an undepreciated basis.

Blanket Overhead Allowances.—The total allowances commonly made by commissions in rate cases for the elements properly classified as overheads vary through quite wide limits, depending in part upon the comprehensiveness of the structural appraisal. Many decisions will be found in which the total allowance is less than the sum of the minimum percentages above stated in connection with the discussion of the various elements. Certain of the items, such as promotion, financing, and going value, are sometimes excluded, and the remaining items grouped in a more or less arbitrary manner. In a general way, it may be stated that, exclusive of going value, which is

ordinarily treated separately, the allowances for overheads range between 15 and 20 per cent, with an increasing number in excess of the latter limit.[1] Fifteen per cent, exclusive of contractor's services and certain other incidentals, is now the standard of the Wisconsin Commission,[2] which makes its own appraisals with commendable thoroughness, although in earlier years it considered 12 per cent sufficient, at least for small properties. As knowledge of the subject and accumulated data of actual experience have increased, the tendency has been toward more liberal allowances for overheads.

Appraisal engineers have frequently been criticized for setting up overhead percentages far in excess of those commonly accepted by the tribunals. Such practice is questionable where the claims cannot be substantiated by actual, extended experience under conditions similar to those found on the property appraised. In many cases allowances by the tribunals have been made by men without engineering or construction experience and, therefore, unfamiliar with actual conditions and requirements. In other cases the allowances have been a compromise of conflicting claims, such as are usually experienced in arbitration proceedings. Where, as is frequently the case, the opposing claims are based on comparatively limited experience, the final findings are apt to be too low rather than otherwise. Utility valuation involves unusual elements which are clearly comprehended only after long experience in the business, and experienced engineers should not hesitate on account of lack of supporting precedents to present the real facts which their experience supports. These facts should not, however, be exaggerated or distorted to offset opposing inadequate claims.

HISTORICAL RELATION BETWEEN INVESTMENT AND COST OF REPRODUCTION

Prior to 1914 the differences between valuations based upon investment and those on cost of reproduction were not so great as to cause extensive controversy. It is true that the general level of prices had been increasing more or less steadily during the preceding twenty years, which witnessed the construction of a large part of public utility properties. The general level of prices

[1] *Re Milwaukee*, P.U.R. 1920 B, 976, 985.

[2] *Re Milwaukee Electric Railway & Light Co.*, P.U.R. 1918 E, 1.

in 1896 was only two-thirds that of 1914, as shown by index numbers in the United States Bureau of Labor Statistics.

Price Index Numbers

It will not be out of order to make brief reference at this point to systems of index numbers through which construction and other price levels and their trends are determined. There are, for this country, helpful indexes of wholesale prices since 1840 and of wages since 1820. European indexes cover a much longer period, although for the most part they lack the accuracy of American compilations. In more recent years indexes of construction costs, living costs, and the costs of various groups of commodities have been developed with varying degrees of sensitiveness to business fluctuations—all helpful in studying price trends pertinent to public utility construction and operation.

The Bureau of Labor Statistics index covers a wider range of commodities, with careful attention to weighting, and is, therefore, more extensively used than other indexes of wholesale commodity prices. The World War brought about radical increases in prices, the maximum level being 247 per cent of the 1913 base used by the Bureau of Labor Statistics. Following the 1920 peak it dropped to 137 but has since risen again to about the 160 level. The changes in level since the middle of 1921 have been comparatively slight, indicating reasonable stability on what may be called a new plateau of prices.

Price History.—Many students of price history in the United States predicted, after the precipitous fall in prices in 1921, that the movements of prices following the War of 1812 and the Civil War would be repeated and that, within a few years, prices would similarly return to pre-war levels. The improbability of such return has been considered earlier in this chapter, but it may be of interest at this point to give some further attention to early price history. For this purpose a curve of wholesale prices is here given (Fig. 3) showing the prices of commodities from 1810 to 1924, inclusive. These prices since 1840 have been taken from the Bureau of Labor Statistics records and the Aldrich Report (Senate Report 1394), made in 1893. Earlier figures are those published by Dr. Ralph G. Hurlin, Director of the Department of Statistics of the Russell Sage Foundation,[1] based on conditions in Boston and vicinity.

[1] *New York Times Annalist*, July 4, 1921.

A striking similarity will be noted between the peak prices of the three wars and the rapid decline immediately thereafter. The progress of this decline was checked in both earlier wars for a few years and then continued. We are now in a similar period of checked decline corresponding quite closely to those which followed preceding wars. The present level has been previously referred to in this chapter as a new plateau of prices but other students (above referred to) have looked upon it as an incident in a price decline corresponding fully with those after previous

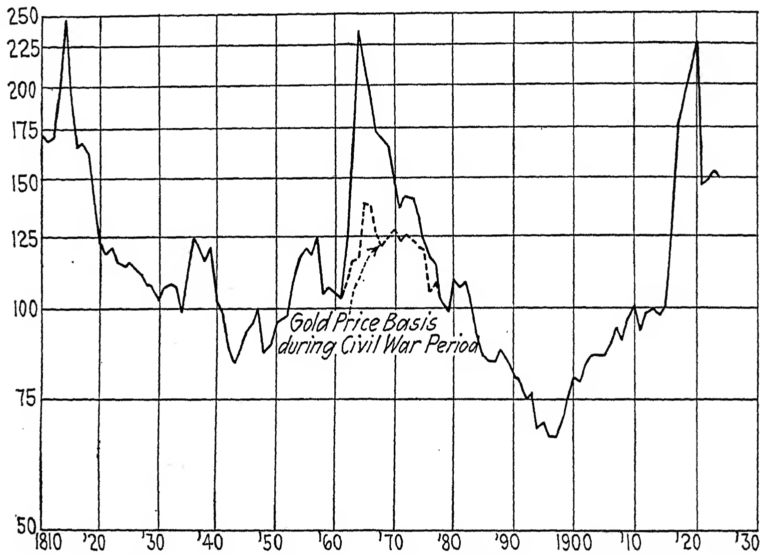

Fig. 3.—Index numbers of wholesale prices 1810–1924. Russell Sage Foundation, 1810–1839. Aldrich Report, 1840–1889. U. S. Bureau Lab. St. (Revised) 1890–1924. 1913 = 100.

wars. A further examination of money conditions in the earlier wars will show that similarity to the World War is lacking. Throughout the World War the United States maintained a gold standard. This standard was suspended during the Civil War, but there are records of the prices of gold in terms of greenbacks throughout this period.

A dotted line on the accompanying curve shows prices during the Civil War period on a gold basis. As distinct from the rest of the United States, Boston banks maintained the gold basis during the War of 1812. Commodity prices in Boston were,

however, doubtless consistent with those in other parts of the country, and so it will not be correct to assume that this early portion of the curve is really on a gold basis, but that a real gold-basis curve for this period would correspond somewhere nearly with that during the Civil War. It follows that the symmetry of price movements in the three wars is destroyed and that World War price conditions cannot be compared directly with those of preceding war periods. It is, of course, true that paper-currency prices in other countries have in recent years influenced prices in the United States to a marked degree, but probably not to an extent justifying comparisons with earlier war periods.

Public utility construction costs have not closely followed the general average of commodity prices in recent years and are now substantially higher than that average because the materials required by public utilities are in general those needed to make up deficiencies in building and other construction requirements during the war period, which have kept these prices above the general level. The present general level of public utility construction costs is about 200 per cent of that of 1913. It is to be expected that this level will tend to fall appreciably in the future when the war deficiencies in general construction requirements have been overcome, and then show somewhat greater consistency with other wholesale prices. This tendency, however, will be influenced largely by labor and transportation costs, which are a very important factor in utility construction and which will probably remain at such high levels for a considerable number of years that full consistency between construction and commodity prices will not be reached.

Utility Construction Indexes.—It may be of interest to show the range of public utility construction prices in New England during and since the war period as determined from a careful study of appraisals and construction cost records involving values aggregating about $500,000,000. Table IX gives the yearly index figures for railway, electric, and gas properties for the years from 1913 to 1924, inclusive. The yearly figures are averages of quarterly records, from which land is excluded.

The divergence shown in the index figures for different classes of property is primarily due to wide variations in prices of steel, copper, lumber, and cast-iron pipe which enter into the construction requirements in different relative amounts. Prior to 1913 the public utility price index had been gradually rising

since 1896, when the lowest recorded level was reached. The increase in general commodity prices during that period was 50 per cent, and the public utility increase was somewhat greater, due primarily to the labor factor.

Table IX.—Relative Costs of Public Utility Construction

Year	Electric railway	Electric light and power	Gas
1913	100	100	100
1914	98	98	98
1915	106	105	103
1916	132	130	126
1917	168	156	184
1918	199	182	221
1919	209	195	228
1920	230	207	256
1921	191	179	200
1922	184	181	190
1923	199	190	209
1924	202	191	213

It, of course, does not follow that the actual cost of public utility properties per unit of capacity or of output has conformed to these indexes. Increasing volume of business and corresponding increases in sizes of units have tended to reduce the construction cost per unit of capacity. Increasing load factors have further tended to stabilize the fixed charges per unit of service. Without such offsetting factors, which are not in evidence to a similar degree in other classes of business, public utility rates would now necessarily be much higher than they are. It is easy to see why, with such wide fluctuations in construction costs, appraisals based on costs of reconstruction at current prices should show radical departure from actual investment and result in controversies to which further reference will later be made.

FUTURE RELATION BETWEEN INVESTMENT AND COST OF REPRODUCTION

Before passing from the subject of price trends it will be of interest to make some further analysis of the future advantages, if any, of cost-of-reproduction appraisals over actual investment from the public utility point of view. It is obvious that a

property which found it necessary to make large investments in the years immediately following the World War, when prices were highest, would now show a cost of reproduction of such parts of its property substantially less than the investment. If public utility prices tend to recede somewhat in the future for greater consistency with the general price level, further loss in cost of reproduction will be experienced, and it is not difficult to foresee a time when the appraisal of the entire property might show cost of reproduction less than the actual investment.

The future relation between these two bases of value naturally depends upon the rate of growth of the properties and the future trend of construction costs. The author recently made certain assumptions with respect to these factors and applied them to a hypothetical property. These were embodied in a discussion of the 1923 report of the Valuation Committee of the American Electric Railway Association.[1] The figures are here reproduced and the discussion summarized because of the importance of the relations shown. They involved a property having, in 1913, 10,000 units with a total assumed value of $1,000,000. The number of units was increased 5 per cent during each year. The cost of each unit existing in 1913 was assumed to be $100, and each year thereafter the cost of similar new units was fixed by the prices actually prevailing or estimated to prevail in that year. For future years prices were based on the assumption that after a preliminary adjustment to greater consistency with other prices there will be a further gradual recession at a rate approximating that during the period of increases from 1896 to 1913. The actual investment in each year was calculated from the original amount in 1913, with additions in each year for the new units at the prevailing price.

The cost of reproduction was also determined by applying in each year the prevailing unit prices to all existing units. These unit prices used for past years do not exactly agree with those given in a preceding table for property of various classes, in that they more nearly fit a combined or composite utility; nor have present prices declined to the extent assumed in 1923. A study of Table X shows an actual reduction in the cost of reproduction immediately following the peak year of 1920, in spite of the additions to the property, following which the cost of repro-

[1] *Proc. Amer. Elec. Ry. Assn.*, 1923, p. 187.

duction gradually increases but not at the same rate as investment. In 1938 and thereafter the investment exceeds the cost of reproduction.

TABLE X.—RELATION OF COST OF REPRODUCTION TO INVESTMENT

Year	Units			Investment		
	Total at beginning of year	Additions during year	Current unit costs	Total at beginning of year	Additions during year	Cost of reproduction
1913	10,000	500	$100	$1,000,000	$ 49,000	$1,000,000
1914	10,500	525	98	1,049,000	56,000	1,029,000
1915	11,025	550	107	1,105,000	72,000	1,180,000
1916	11,575	580	130	1,177,000	96,000	1,505,000
1917	12,155	605	165	1,273,000	118,000	2,006,000
1918	12,760	640	195	1,391,000	131,000	2,488,000
1919	13,400	670	205	1,522,000	151,000	2,748,000
1920	14,070	705	225	1,673,000	131,000	3,166,000
1921	14,775	740	185	1,804,000	133,000	2,734,000
1922	15,515	775	180	1,937,000	151,000	2,794,000
1923	16,290	815	195	2,088,000	151,000	3,178,000
1924	17,105	855	185	2,239,000	150,000	3,165,000
1925	17,960	895	175	2,389,000	152,000	3,144,000
1926	18,855	945	170	2,541,000	157,000	3,206,000
1927	19,800	990	166	2,698,000	161,000	3,287,000
1928	20,890	1,045	163	2,859,000	167,000	3,405,000
1929	21,935	1,095	160	3,026,000	172,000	3,510,000
1930	23,030	1,150	157	3,198,000	177,000	3,616,000
1931	24,180	1,210	154	3,375,000	184,000	3,723,000
1932	25,390	1,270	152	3,559,000	191,000	3,859,000
1933	26,660	1,335	150	3,750,000	198,000	3,909,000
1934	27,995	1,400	148	3,948,000	204,000	4,143,000
1935	29,395	1,470	146	4,152,000	212,000	4,291,000
1936	30,865	1,545	144	4,364,000	219,000	4,444,000
1937	32,410	1,620	142	4,583,000	227,000	4,600,000
1938	34,030	1,700	140	4,810,000	235,000	4,764,000
1939	35,730	1,790	138	5,045,000	243,000	4,940,000
1940	37,520	.....	136	5,288,000	....	5,103,000

With a property growth more rapid than that assumed, investment would overtake cost of reproduction at an earlier date, and such more rapid growth has been experienced in many cases. Furthermore, the additions to property of many companies, particularly electric companies, during the period of peak prices when production was particularly active, were greater than

normal, which would have a further marked effect in reducing the time necessary for investment to overtake cost of reproduction. It is also the custom of many commissions to make deductions from cost of reproduction for depreciation without making corresponding deductions from actual investment or to find a compromise fair value substantially less than cost of reproduction.

If the reproduction cost shown in the accompanying table is uniformly reduced by an assumed 15 per cent for depreciation, compromise, or otherwise, the actual investment will overtake such reduced value before 1930. It is apparent, therefore, that cost of reproduction will have no permanent advantage from the public utility point of view over investment except for properties of slow or negligible growth. Aside from other considerations, the benefits to be gained by a continued program of education with reference to the legal rights of public utilities to recognition of present cost of reproduction are comparatively small when the time required for such education and the common practice of compromise between the investment and reproduction methods are taken into consideration.

RELATIVE WEIGHTS IN VALUATION OF INVESTMENT AND COST OF REPRODUCTION

The problem of relative weights to be assigned to investment and cost of reproduction in the determination of a suitable rate base has been given exhaustive attention in the cases before commissions and courts, particularly in recent years when the difference has been especially great. The discussion of the matter began in the *Smyth vs. Ames* case, in which the railroad sought to use original investment and the state urged cost of reproduction which then gave a substantially lower amount. In more recent years the parties to similar contests have urged that basis of value which results in higher or lower rates, for which they were respectively contending. Such change in views as to the basis of value, particularly on the part of the public utilities, has frequently been criticized but, as will be seen, it has had logical foundation.

As far as the tribunals before which rate cases have been heard are concerned, the courts to which appeals have been taken have maintained a reasonably consistent stand throughout, whereas the commissions have shown much less consistency. Their

early findings of value were based quite generally upon actual investment where it could be determined from accounting records, and, in the absence of such records, upon appraisals in which historical prices and conditions of construction were given preference. A number of the commissions, notably those in Massachusetts and the Pacific Coast states, have continued to use this basis of value, giving little if any attention to present cost of reproduction.[1] Other commissions in increasing numbers have given substantial recognition to cost of reproduction. Such, at least, has been their contention in their decisions, although the final findings of value may not have appeared wholly consistent with such contentions.

Analysis of Commission Decisions

The 1923 report of the Valuation Committee of the American Electric Railway Association embodies a study of decisions of commissions during the recent years when higher prices have prevailed. This study involved an analysis of the decisions of each commission, a summary of what appeared to be the prevailing views of the commission, and correspondence with the commissions to substantiate the interpretation of these views which the Committee had made. The report of this Committee shows that only 15 per cent of the decisions during these years embodied values based upon estimated or actual investment; 69 per cent gave some recognition to the cost of reproduction, although very few cases recognize this as the dominant factor. The remaining cases use the split-inventory, trend-price, or some other special basis. A study of more recent decisions of courts and commissions has disclosed no definite tendencies in favor of either investment or cost of reproduction other than a disposition more generally to give real consideration to both bases in the finding of final value.

LEGAL BASIS FOR COST-OF-REPRODUCTION VALUATIONS

The legal and economic considerations regarding the basis of value disclosed in the various decisions are here briefly summarized. The cost-of-reproduction argument points out the

[1] *Re Pacific Gas & Electric Co.* (Cal.), P.U.R. 1923 C, 385, 403; *Re Bay State Street Railway Co.* (Mass.), P.U.R. 1916 F, 221; *Re Portland Railway Light & Power Co.* (Ore.), P.U.R. 1916 D, 976.

consistent findings of the courts that the constitutional protection of property extends to its present value and not its cost. Such findings are illustrated by the following quotations from leading cases:

And we concur with the court below in holding that the value of the property is to be determined as of the time when the inquiry is made regarding the rates. If the property, which legally enters into the consideration of the question of rates, has increased in value since it was acquired, the company is entitled to the benefit of such increase. (*Willcox vs. Consolidated Gas Co.*, 212 U.S. 19.)

The property is held in private ownership and it is that property, and not the original cost of it, of which the owner may not be deprived without due process of law. (*Minnesota Rate Cases—Simpson vs. Shepard*, 230 U.S. 352.)

In the solution of that problem (valuation), many considerations may enter; among them, the amount of money actually invested. But that is by no means, of itself, controlling, even where the property was at the time fairly worth what it cost. If it has since enhanced in value, those who invested their money in it, like others who invest their money in any other kind of property, are justly entitled to the benefit of the increased value. If, on the other hand, the property has decreased in value, it is but right that those who invested their money in it, and took the chances of an increase in value, should bear the burden of the decrease. (*San Diego Land & Town Co. vs. National City*, 74 Fed. 79.)

It is not a question of what was actually expended in the plant in question, but what it would cost to reproduce a similar plant at the present time. (*Des Moines Gas Co. vs. City of Des Moines*, 238 U.S. 153.)

The record clearly shows that the Commission in arriving at its final figure did not accord proper, if any, weight to the greatly enhanced costs of construction in 1920 over those prevailing about 1915 and before the war, as established by uncontradicted evidence; and the company's detailed estimated cost of reproduction new, less depreciation, at 1920 prices, appears to have been wholly disregarded. This was erroneous. (*Bluefield Water Works & Improvement Co.*, 262 U.S. 679, P.U.R. 1923 D, 11, 17.)

. . . That to proceed with a valuation of a utility for rate-making purposes by valuing its property at pre-war prices, and then adding thereto one-half of the increase, in prices between that time and the time of the valuation, with the view of dividing the increased valuation by reason of rising markets, about equally between the utility and the public is nothing more or less than an effort to confiscate so much of the company's property as was represented by one-half of the increase in market values between the pre-war period and the present time. (*Mobile Gas Co. vs. Alabama Public Service Commission*, 293 Fed. 208;P.U.R. 1924 B, 644, 658).

Particularly when we read the dissenting opinion, we must construe the majority opinion as the minority of the court interpreted it, *viz.*—as hold-

ing that, where it stands not impeached or attacked otherwise than it was in the *Southwestern Bell Telephone* case, the reproduction cost is the dominating element in the fixing of the rate base. (*Monroe Gas Light & Fuel Co. vs. Michigan Public Utilities Commission et al.*, 292 Fed. 139; P.U.R. 1923 E, 661, 671).

The utilities have pointed out with logic that, if the protection of the courts does not extend to investment, any case resting upon investment as a basis of present value should not be relied upon before the commissions if there is any probability of appeal from their decision. There appears to be an increasing number of utilities which appreciate the advantages of investment as a rate base but feel that, in view of the attitude of the courts, they cannot safely adhere to this basis, at least without also presenting evidence of cost of reproduction to be used in case of an appeal to the courts.

It is further contended that the prices of competitive commodities have been adjusted to allow a fair return upon present costs of productive facilities and that there is no economic reason why regulated public utilities should be treated differently from competitive industries. Value is conventionally measured in dollars, and the value of the dollar in commodities at the present time is very much less than such value ten years ago. The price of a particular article may be $160 today whereas ten years ago it was $100, but the intrinsic value, or its value in other commodities, may be unchanged. Public utilities may, therefore, urge that the same measure of value be applied to their properties as is applied to other properties, and that if this measure has shrunk one-third, they should be entitled to the apparent increase in value, however unreal this increase may be. A recent federal case points out this distinction very clearly and the injustice of holding down public utility present value to that measured in dollars of the past:

A profit based upon the enhanced value of the capital adds nothing to the company's wealth. Though its capital be measured in more dollars and so, too, its profit, that profit is still paid in the fallen dollar and has not greater buying power than it had before. The increased valuation of the capital will for the years of the depreciated dollar leave the company exactly as it was; it will merely prevent its being compelled to share its putative fair profit with its customers, which by hypothesis it should not be asked to do. The company gains nothing, the customers lose nothing.[1]

[1] *Re Consolidated Gas Co.*, 267 Fed. 231, affirmed in 258 U.S. 165.

Public utilities have urged present cost of reproduction as a rate base in many recent cases as a matter of expediency rather than principle because of the higher cost of money. They have contended that rates of return within the limits conventionally fixed in regulatory practice, if applied to actual investment, would not yield a return in dollars sufficient to attract capital to public utilities in competition with other business in which similar limitations upon value do not exist. The author has frankly stated in various cases before courts and commissions that a rate base was sought which, with the highest practicable rate of return, would yield a sufficient return in dollars to attract investors and maintain the credit of the companies, and that such a rate base was necessarily substantially higher than actual investment.[1] Under present money market conditions this argument has less weight than when it was used during the war period and the years immediately following.

Another argument against actual investment is presented more for its theoretical aspects than its practical application. An assumed public utility has a plant constructed at pre-war prices. During the period of peak prices it made contracts with large customers who might have installed their own power plants but found they could purchase power at lower cost from this public utility which was restricted to a return upon its actual investment. The volume of such power business ultimately secured under these circumstances was so large that substantial additions to power facilities were made at war peak prices and much of the older low-cost equipment was retired. This required higher power rates, and when, after a period of years, construction costs receded from the peak level, these large customers found that they could then install and operate their own power plants at a cost lower than would yield a fair return upon the investment in the public utility plant. Power contracts were, therefore, not renewed and the utility plant was left with idle capacity, a return on which would require a substantial increase in rates for the remaining retail service for which competitive substitutes are not readily available. Such increases in rates would logically continue until natural growth in business called for the use of this idle capacity. It is conceivable that the power plants privately installed by large former power customers might wear out at the time another cycle of high construction

[1] *Re Reno Power, Light & Water Co.*, 298 Fed. 790; P.U.R. 1923 E, 485.

costs had been reached and power would again be purchased from the utility plant temporarily until construction costs had receded sufficiently to make another private plant profitable. Such synchronism between long-range construction cost cycles or multiples of them and the life of private power plants is hardly to be expected, but the possibility, nevertheless, exists of recurrent embarrassments to public utilities serving large power customers if they are restricted to a return upon their investment.

ECONOMIC ADVANTAGES OF INVESTMENT

Many convincing arguments have been presented in rate cases in favor of investment as the rate base. The conventional argument is that such a rate base is determined from facts and not estimates, theories, or speculations, and that the fixing of the rate base at any time simply involves the adding of capital expenditures as shown by accounting records subsequent to any previous date when the rate base was fixed, the assumed alternative being the determination of an entirely new cost of reproduction for each rate case, at least where material changes in price levels have occurred.

This is a forceful argument and has an appeal to the public utilities through its avoidance of expensive appraisals, the controversies incident thereto, and the distraction of the attention of executives from routine duties. It is further contended that the consistent use of investment as a rate base tends to remove public utilities from the speculative class of enterprises and to make them attractive to conservative investors, which would be impossible under the reproduction method of valuation. This may be illustrated by an assumed public utility constructed at a cost of $1,000,000 at times of peak prices, with an investment consisting of 60 per cent bonds, 15 per cent preferred stock, and 25 per cent common stock. If in due time prices receded to the extent of 25 per cent, and the value of the property was reduced accordingly in a rate case, the dividends upon the common stock would cease, and its entire value would disappear. The margin for dividends upon and of value in the preferred stock would also disappear, making such stock unmarketable, and the margin for the bonds would be so reduced as substantially to decrease their market value and correspondingly increase the yield. No conservative investors would consider the preferred

stock, to say nothing of the common, and probably would not purchase the bonds. The only way in which a public utility under such conditions could protect itself and its investors from loss would be through the creation of an amortization reserve to offset possible decreases in cost of reproduction. A practicable way of utilizing such a reserve for the protection of investors has not been disclosed, and its accumulation would be a serious burden upon customers.

Public utilities, unlike other industries, are required to render adequate service at all times. This involves the making of substantial investments at times of high prices, as the history of recent years has shown, particularly with electric and gas companies. Other industries can adjust the volume of their business, if they so desire, so that investment in new facilities can be made in periods of low rather than high prices. An investment forced upon a public utility in times of extreme prices should obviously be protected unless some reserve for amortization is provided. Such a reserve, necessarily indefinite, would probably cost the customers more than a sustained return upon actual investment when prices have fallen. The cost-of-reproduction method has so often been characterized as visionary, fictitious, inflated, and oppressive that any simple substitute under which the utilities can find protection should be welcome in the interests of improved public relations as well as stability in the investment market. The argument in favor of "prudent investment" as a rate base was stated in a masterly way in the dissenting opinion of Mr. Justice Brandeis in the *Southwestern Bell Telephone* case in 1923. The following extracts are taken from this dissenting opinion:

> The adoption of the amount prudently invested as the rate base and the amount of the capital charge as the measure of the rate of return would give definiteness to these two factors involved in rate controversies which are now shifting and treacherous, and which render the proceedings peculiarly burdensome and largely futile. Such measures offer a basis for decision which is certain and stable. The rate base would be ascertained as a fact, not determined as a matter of opinion. It would not fluctuate with the market price of labor, or materials, or money. It would not change with hard times or shifting populations. It would not be distorted by the fickle and varying judgments of appraisers, commissions, or courts. It would, when once made in respect to any utility, be fixed, for all time, subject only to increases to represent additions to plant, after allowance for the depreciation included in the annual operating charges. The wild uncertainties of the present method of fixing the rate base under the so-called rule of *Smyth vs. Ames* would be avoided; and likewise the fluctuations which introduce

into the enterprise unnecessary elements of speculation, create useless expense, and impose upon the public a heavy, unnecessary burden . . .

The expense and loss now incident to recurrent rate controversies is also very large. The most serious vice of the present rule for fixing the rate base is not the existing uncertainty; but that the method does not lead to certainty. Under it, the value for rate-making purposes must ever be an unstable factor. Instability is a standing menace of renewed controversy. The direct expense to the utility of maintaining an army of experts and of counsel is appalling. The indirect cost is far greater. The attention of officials high and low is, necessarily, diverted from the constructive tasks of efficient operation and of development. The public relations of the utility to the community are apt to become more and more strained. And a victory for the utility, may in the end, prove more disastrous than defeat would have been. The community defeated, but unconvinced, remembers; and may refuse aid when the company has occasion later to require its consent or cooperation in the conduct and development of its enterprise. Controversy with utilities is obviously injurious also to the public interest. The prime needs of the community are that facilities be ample and that rates be as low and as stable as possible. The community can get cheap service from private companies, only through cheap capital. It can get efficient service, only if managers of the utility are free to devote themselves to problems of operation and of development. It can get ample service through private companies, only if investors may be assured of receiving continuously a fair return upon the investment.[1]

Interesting opinions of commissions confirmatory of the above are also quoted below:

Accordingly, we rule that under Massachusetts law capital honestly and prudently invested must, under normal conditions, be taken as the controlling factor in fixing the basis for computing fair and reasonable rates; that if there is mismanagement causing loss, such loss must be charged against the stockholders legally responsible for the mismanagement; that reproduction cost either with or without depreciation, while it may be considered, is not, under our law, to be taken as the determining basis for reckoning rates. (*Re Middlesex & Boston Street Railway Co.* (Mass.), 2 M.P.S.C.R. 99, 111.)

Section 72 of the law provides that "In determining the price to be charged for gas or electricity the Commission may consider all facts which in its judgment have any bearing upon a proper determination of the question although not set forth in the complaint and not within the allegations contained therein, with due regard among other things to a reasonable average return upon capital *actually expended* and to the necessity of making reservations out of income for surplus and contingencies." The Commission regards as a serious omission the failure of the company to produce the records, although requested to do so. In the absence of such records, the Commission does not feel warranted in accepting estimates which appear to be unduly and unreasonably large, and are not supported by the

[1] 262 U.S. 276; P.U.R. 1923 C, 193, 214.

examination and estimates of our own engineers. (*Mayhew vs. Kings County Lighting Co.*, 2 P.S.C. (I) N.Y., decided Oct. 20, 1911.)

Perhaps the nearest approximation to the fair standard is that of bona fide investment—the sacrifice made by the owners of the property—considering as a part of the investment any shortage of return that there may be in the early years of the enterprise. (*Interstate Commerce Commission* (Western Rate Case), 20 I.C.C.R. 307, decided Feb. 22, 1911.)

Estimated reasonable historical cost is not the only factor that should be considered in arriving at a proper basis of rates, but we believe it must be the controlling factor, provided the resulting rates are within the constitutional limitations. For ten years this Commission has followed such a policy and under that policy utility companies have prospered and are now on a sounder financial basis than they were ten years ago. At the same time many of the rates they charge are lower today than ten years ago, and considering the state as a whole, but few commodities are as close to pre-war prices as electricity. Careful consideration and reconsideration of the question by succeeding members of the Commission has uniformly resulted in the conclusion that this policy is sound, and, what is perhaps more convincing, it has satisfactorily stood the test of time and the extreme conditions of the past few years. (*California Railroad Commission re Pacific Gas & Electric Co.*, P.U.R. 1923 C, 385, 408.)

While we recognize that the cost of reproduction at present-day prices is an element which must be given consideration in fixing value, we do not believe that that element should be controlling in the matter of valuation or of foremost importance . . .

In the long run, regardless of whether the tendency of prices is up or down, it seems to us that the effect upon the customer and upon the business is bound to be unfavorable since it can only result in the necessity of higher rates than would be necessary with the business properly stabilized and made attractive for investment. (*Wisconsin Railroad Commission re Duluth Street Railway Co.*, P.U.R. 1923 D, 705, 729, 733.)

POSSIBLE RECONCILIATION OF LEGAL AND ECONOMIC VIEWS

Summarizing the above discussion as to relative weights to be given to investment and reproduction methods, it appears that the investment basis would be more widely acceptable to public utilities if protection could be secured from the courts thereunder. Unfortunately, no plan of reconciliation of these two methods and of the diverse inclinations of commissions and courts has so far been developed. A suggestion looking to such reconciliation has been made and may prove helpful in the future. This suggested reconciliation is based upon the provision of the fifth amendment to the Federal Constitution, which stipulates that private property shall not be taken for public use without just compensation. When such property is taken for public use the

value allowed is that at the time of taking. When investors put their funds into a public utility project they do so with the knowledge that such property is devoted to public use and is under restrictions which amount to a taking from them of certain rights and freedom enjoyed by property not dedicated to public use. It may, therefore, be said that there is a "taking" of private property at the time of such dedication, the "taking" involving among other things the right to restrict such property to a fair return upon the actual investment therein. This at least may be true of investments made under regulation.

As to investments made prior to the passage of regulatory acts, it may be claimed that such investments have also been made subject to known powers of regulation which might be invoked at any time, and that in such cases also there was a "taking" either at the time of the actual investment or when regulatory acts became effective, the latter being perhaps more logical in the light of incomplete early knowledge of the possible scope of regulation. Under such conditions or assumptions, therefore, it might be held that the value of property devoted to public service was its actual investment, the value at the time of the "taking," instead of some other value which might be found at the time of a subsequent inquiry.

SOME UNSETTLED PROBLEMS IN VALUATION

Several controversial points in valuation cases have not yet been considered. One involves the disposition of so-called abandoned property. Many public utilities, particularly street railways, have made large investments in property which, through radical engineering developments or public demands, have been retired from service when comparatively new. Such investments include cable railway systems replaced by electric power, overhead lines replaced by underground construction in large city areas, and generating units, arc lamps, cars, and other apparatus, abandoned for similar reasons long before any adequate retirement reserve could be created.

It is frequently contended that such property, although possibly surviving in part, is no longer "used and useful in the public service" and should, therefore, be excluded from the rate base. Such contention is plausible in connection with a cost-of-reproduction appraisal, but, when investment is considered, such

property represents the funds of stockholders or others which have not been recovered and are necessarily as much a part of outstanding capital as if the property were in daily use. A specific illustration may be used of a right of way, purchased originally in the outskirts of a growing city. Gradually, houses were built along this right of way, the space beside the track developed into a traveled way, and ultimately the city took it over and made it a street without any formality of payment. The investment of the street railway remained and should continue as an element of value until retired through reserves actually created from revenue. As a matter of equity the city should pay for such rights of way through general taxation, for the car riders as a whole who would otherwise pay for them on the instalment plan are probably not directly benefited by the opening of particular streets and may be inconvenienced by car service delays due to street traffic.

In general, abandoned property, purchased originally in good faith and in the public interest, should continue as a part of the rate base until reasonable opportunity has permitted its amortization. In some cases, as elsewhere pointed out, such amortization can be effected out of the increased net income which the substitute property earns. Under any other general plan of procedure than that outlined an investment in public utilities would be subject to a hazard not found in other business, which would tend to raise the cost of money and otherwise discourage its investment.

Another question occasionally arising in valuation proceedings relates to property acquired in advance of actual needs in the public service. It is contended that such property should be excluded from the rate base on the ground that it is not useful, or that it was bought as a speculation, to prevent competition, or with exaggerated forecasts of the development of the community and its needs of utility service. Large investments are habitually made by public utilities in excess of immediate needs. They buy real estate adjacent to their developments to prevent future extortionate payments when expansion is necessary. They buy generating units larger than the immediate business requires because the cost per unit of capacity is less and the efficiency of the larger units is enough higher to make the average unit cost of the service over a term of years lower than under a more hand-to-mouth program. It does not follow, because such

prudent investments are proper elements of value, that all investments for future needs, however extravagant and unwise they may be, should be similarly included. Mistakes beyond those commonly paid for in the market for competitive commodities should be charged against those who commit them, after the responsibility has been clearly fixed.

"YARDSTICK" APPRAISALS

Reference was made earlier in this chapter to the "yardstick" method of making appraisals. This method involves certain short-cuts and approximations which reduce the cost of appraisals without corresponding effect upon their accuracy. It has been favored because of the unnecessary intricacy and expense involved in many appraisals, and controversies over details which yield no helpful results. The cost of appraisals varies between wide limits, depending upon the size and location of the property, the completeness of construction records, the amount of detail, and the methods of pricing required. A simple cost-of-reproduction appraisal will cost from one-third to two-thirds of 1 per cent of the valuation total. If the property is small or several different price bases of value are required and accrued depreciation must be estimated, the cost may be double the conventional figures given. Such costs, together with the presentation of the appraisals in evidence with the frequent prolonged discussion and legal formalities, are not warranted by their effect upon the final findings in the case—reasonable rates.

To the final rate base established by the tribunal there must be applied percentages for return to investors and retirement requirements, neither of which is subject to exact computation. The total amounts thus found for these elements of cost are usually materially less than 50 per cent of the total service cost to be covered by the rates in question. If an error of 10 per cent is made in the rate-base finding or in the rate of return, the resultant required revenue will be affected by less than 5 per cent. If errors of such magnitude are made in both these factors but in opposite directions, the answer will still be correct. Errors of this magnitude are, for the time being at least, inevitable in connection with the rate of return and also in determining suitable retirement appropriations.

Operating expenses as shown on utility books may also need adjustment downward or upward to meet the conditions of the

case. Furthermore, if exactness in required revenue were possible, material errors are to be expected in the fixing of rates to yield this revenue. Exactness, as a matter of fact, is not possible at any step in the whole procedure, and, from a mathematical viewpoint, where several factors are involved in a problem, the correctness of solution is not materially increased by accuracy in any one factor considerably in excess of that possible in the others.

What refinement, in the light of the above considerations, is appropriate in an appraisal? Certainly not that involving the counting of spikes, bricks, pipe threads, bolts, and a multitude of small fittings which usually bear a reasonably stable ratio to related important elements. An experienced contractor, in making up a lump-sum proposal for constructing a large building, will not prepare schedules of material and labor in as much detail as is done in many appraisals, and yet his business success depends upon the accuracy of this work.

The reports of the Valuation Committee of the American Electric Railway Association for 1921, 1922, 1923, and 1924 discuss the methods and possibilities of reduced refinement in appraisals, and show, by actual figures in specific cases, that accuracy is not thereby sacrificed. It is, however, pointed out that approximations beyond those usually accepted by the tribunals cannot safely be used except by agreement between the parties involved in the case. Such agreements should be sought whenever possible and should receive the hearty approval of the tribunals, at least the regulatory commissions. It is also true that approximate methods of valuation require broad, practical experience. Such experience, to an exceptional degree, makes it possible to value, for example, a complete railway system of known character on the basis of a certain sum per mile of track as accurately as could be done by an inexperienced engineer with apparent extreme refinement of inventory.

ACCRUED DEPRECIATION

No reference has so far been made to the much discussed question of deductions in valuation for so-called accrued depreciation. This subject is of such importance that it will be discussed in a subsequent chapter. Further reference is also made to its accounting features in the chapter on Accounting. It will be sufficient to say at this point that the decisions of the commission show very few cases of deductions for depreciation from actual

investment, but a larger number in cases where cost of reproduction has been used primarily as a basis of value. It is not clear that such a distinction is justified. The contention is made that, because the property has been given the benefit of appreciation in prices, it should logically be subject to offsetting deductions for depreciation.

The assumed relation between appreciation and depreciation does not, in fact, exist, at any rate to the extent assumed. Appreciation results from two classes of causes: one, community development or removal of business hazards; the other, a change in general price level or the value of the dollar. There may be some justification in associating depreciation with the first of these causes of appreciation, but in the public utility business such appreciation is primarily limited to real estate, which is not subject to physical depreciation. Changes in value of the dollar, as has already been seen, add nothing to the real value of the property. A piece of real estate would not change in size if the yardstick with which it was measured were reduced to 2 feet. If, or to the extent that, no value is really added by so-called appreciation, nothing on that account should be deducted for depreciation. Certain conditions under which deductions for accrued depreciation may be permissible are discussed in the following chapter, together with methods by which such deductions may be wholly avoided with justice to all interested parties.

The consideration of this involved and much discussed subject of valuation may appropriately be summarized and concluded by a well-known quotation from the opinion written by Mr. Justice Hughes in the *Minnesota* rate cases:

> "The ascertainment of that value is not controlled by artificial rules. It is not a matter of formulas, but there must be a reasonable judgment having its basis in a proper consideration of all relevant facts."[1]

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CHAPTER VIII

DEPRECIATION

The following discussion of the subject of depreciation deals with the relation of the subject to valuation, which has been referred to in the preceding chapter, and the extent and character of the reserves that should be accumulated, which has also been considered in part in the chapter on Accounting. The word "depreciation" is used with some reluctance because of the wide range of meanings applied to it with the resulting confusion and uncertainty, and in this chapter and elsewhere in the book, as far as practicable, the word "retirements" has been substituted as a more definite and appropriate term. As noted in the chapter on Accounting, the word "depreciation" does not occur anywhere in the uniform system of accounts officially adopted for electric and gas utilities. The confusion with respect to depreciation may be reduced somewhat by the qualifying words "accrued" and "accruing," referring, respectively, to the phases of the subject dealing with valuation and the recurrent charges entering into the cost of service, but because these or other qualifying terms are frequently omitted in discussions of the subject, the resulting confusion has logically led to the substitution of an entirely distinct term which has the advantage of definiteness but is more restricted in meaning and application.

HISTORY OF ACCRUED DEPRECIATION THEORY

Before taking up the technical phases and current thought on this subject it will be of interest briefly to review its history in court and regulatory procedure. It has already been stated that the commonly quoted leading case in which the United States Supreme Court first discussed valuation is that of *Smyth vs. Ames*, decided in 1898. This case makes no mention of accrued depreciation or deductions therefor in determining fair value, listing among the factors to be considered "the present as compared with the original cost of construction." For more than ten years following this decision the subject of accrued deprecia-

tion does not appear to have had the careful attention of the Supreme Court in public service cases except in an indirect way. In a few early cases the subject of allowances for future retirements in addition to current costs of repairs and replacements was considered by the courts, and such allowances were denied.[1] The logical inference from such denial would be that no deductions for accrued depreciation would be made.

It was not until the *Knoxville* decision in 1909 that the subject of depreciation was clearly presented as an issue before the Supreme Court. Since that time this case has been the foundation on which courts, commissions, and other interested parties have built up the practice of reduction of value on account of this factor. The discussion of depreciation in this case apparently arose in connection with the contention of the water company of its rights to include in the value of its property not only the surviving used and useful property but also certain facilities which had either entirely disappeared or, although surviving, had ceased to be useful but, because of inadequate reserves, had not been written off from the company's books. To show the extent to which this case may be used in support of deductions for depreciation, the clear and forceful language of the decision should here be quoted:

> Before coming to the question of profit at all the company is entitled to earn a sufficient sum annually to provide not only for current repairs but for making good the depreciation and replacing the parts of the property when they come to the end of their life. The company is not bound to see its property gradually waste, without making provision out of earnings for its replacement. It is entitled to see that from earnings the value of the property invested is kept unimpaired, so that at the end of any given term of years the original investment remains as it was at the beginning. It is not only the right of the company to make such a provision, but it is its duty to its bond and stockholders, and, in the case of a public service corporation at least, its plain duty to the public . . . If, however, a company fails to perform this plain duty and to exact sufficient returns to keep the investment unimpaired, whether this is the result of unwarranted dividends upon over-issues of securities or of omission to exact proper prices for the output, the fault is its own. When, therefore, a public regulation of its prices comes under question, the true value of the property then employed for the purpose of earning a return cannot be enhanced by a consideration of the errors in management which have been committed in the past.[2]

[1] *San Diego Land & Town Co. vs. Jasper*, 189 U.S. 439, 446; *Re Redlands Water Co.*, 121 Cal. 365.

[2] 212 U.S. 1, 13.

Following the *Knoxville* case came a number of decisions of federal and state courts in which this case was cited and deductions for depreciation made.[1] In 1913 the Supreme Court decided the *Minnesota* rate cases, in which depreciation was again given careful attention. The views with respect to this matter are summarized in the following quotation:

> It must be remembered that we are concerned with a charge of confiscation of property by the denial of a fair return for its use; and to determine the truth of the charge there is sought to be ascertained the present value of the property . . . And when particular physical items are estimated as worth so much new, if in fact they be depreciated, this amount should be found and allowed for. If this is not done, the physical valuation is manifestly incomplete.[2]

Those who oppose deduction for accrued depreciation point out that in neither the *Knoxville* nor the *Minnesota* cases is it clearly held that deduction from actual or estimated cost should be made for what is known as accrued depreciation, *i.e.*, depreciation due to gradually increasing age or prospective unsuitability of property units. The *Knoxville* decision does make reference to gradual waste of property and to the propriety of provisions from earnings to keep the value unimpaired. The *Minnesota* decision is much less specific in this respect; in fact, it seems to present a materially different view of the matter. It holds that the cost new of particular items must be reduced if "*in fact*" these items be depreciated. It is inconceivable that any substantial part of a large railroad system, such as those under consideration, should be wholly new and, therefore, with few exceptions, deductions would be required if based upon lapse of time rather than physical condition. If, as it appears, deductible depreciation must be tangible and obvious rather than theoretical, the age-life basis, so frequently used and hereafter discussed, is given no support in the *Minnesota* cases and is not clearly supported in the *Knoxville* case.

It is of interest to note that the Supreme Court handed down a decision in the *Consolidated Gas* case on the same day the *Knoxville* decision was rendered. In this case no claims were made for the inclusion of retired or obsolete property in the valuation and, although a substantial part of the property had

[1] *Re Pioneer Telephone & Telegraph Co.*, 118 Pac. 354; *Re Bonbright*, 210 Fed. 44; *Re Kings County Lighting Co.*, 156 App. Div. N. Y. 603.

[2] 230 U.S. 352.

undoubtedly lived a considerable proportion of its useful life, no deduction on that account was made. The only deduction was for an insignificant amount of deferred maintenance.

MODIFIED VIEWS IN RECENT COURT CASES

Since the *Minnesota* decision there have been many cases of deduction for depreciation by supreme, federal, and state courts, some of which assume that deductions should be made because the property was not new, others because of obvious deterioration, and still others for reasons not clearly stated. In recent years, however, this tendency to follow the early decisions has been less in evidence. In fact, a decided tendency is noticeable away from deductions for depreciation because of age or lack of newness, as appears in the following quotations from typical cases:

> Practical men will prefer to ascertain the cost of a present plant by experience, when they can, rather than by estimate, just as the master here has done. In so arriving at the cost of a present plant of equal capacity, it is clear that the original cost of the plant in question must be abated by depreciation, so far as that is reflected in a loss of capacity. In such a calculation, however, there must figure past renewals as an offset to past depreciation and if, in fact, the capacity has remained the same, depreciation should not be a function of the "rate base" at all. In such a case the inquiry as to depreciation should be confined to changes in "price levels."
>
> . . . The plaintiff proved the cost and the necessary repairs to bring the whole plant up to its original condition. It proved that the cost of reproducing fixtures of equal capacity was more than the book cost. That made a case, in my judgment, which was proof against any theory of "straight-line" depreciation. The allowance for repairs might be attacked on the ground that the condition of the plants and fixtures in fact required inordinate repairs, but that was not done. In accordance with the principle which I have tried to demonstrate I decline to make any allowance for depreciation. (*Consolidated Gas Co. vs. Newton*, 267 Fed. 231; P.U.R. 1920 F, 483, 495, 531.)

The decision of the district court in this case was fully confirmed, upon appeal, by the United States Supreme Court.[1]

> Upon the present trial, it was insistently urged upon me by some of the defendants that there should be deducted from the cost of the property (irrespective of whether "original," "pre-war," or "present reproduction" cost be under consideration) an amount claimed to represent so-called "accrued theoretical depreciation," based upon an assumption of "life expectancy" for a gas plant and equipment and the estimated or known number

[1] 258 U.S. 165; P.U.R. 1922 B, 752.

of years since the same was erected or installed. From the testimony given upon the trial, I was strongly impressed that in respect of a very large proportion of gas property, there is no ascertainable "life expectancy." The withdrawal of such property from service comes about from inadequacy or absolescence which cannot be forecast in terms of years or even satisfactorily guessed at. Certain parts of operating machinery and equipment are of course subject to the effects of use. The replacement of these wearing parts enters into the cost of repairs. As to the substantial units of structures, apparatus, mains, and equipment, their withdrawal from the property accounts comes about from causes not attributable to the condition of the property itself or any diminution in its operating efficiency but varying utterly with the particular plant, time, local conditions, and service demands, and hence capable of being forecast only as the occasion for such change in plant or equipment becomes imminent . . .

. . . The loss, due to such supersession, cannot properly be said to have accrued during the period the superseded unit was in service. It *occurred* when supersession took place. It became a proper charge against the economies to be realized therefrom. It furnished no basis for the imposition of an additional charge against the user of the superseded unit during the period of its useful service over and above the higher cost of operating it. Such a charge could not be justified either on the ground that the unit was losing potential life, or that the capital invested in it was being consumed, because neither is true. (*New York & Queens Gas Co. vs. Newton,* 269 Fed. 277; P.U.R. 1921 A, 530, 538.)

The above quotation is from the report of the master which was approved by the court with respect to this matter. In a more recent case of the same company the master reported in like tenor as follows:

There should be allowed to the plaintiff, to be included as an item in its operating expense, an amount necessary to provide a reserve against which may be charged the original cost of all property retired from service plus the cost of dismantling the same, less the salvage thereof. Such reserve should be sufficient to cover such retirement losses as may reasonably be expected, in order that the burden of such losses may be as nearly as practicable equalized from year to year, and the sum so allowed should be in addition to the necessary cost of keeping the plant and equipment in a high state of efficiency through charges to the regular maintenance account . . .

In view of these facts, I am unable to find any accrued or "straight-line" depreciation, as it is sometimes called. I have deducted the amount Mr. Burt and Colonel Miller testified would be required to put the property in as good condition as new as showing the amount of the renewals and replacements necessary to be made in the so-called regular course of its business from future earnings and because, as I have already stated, they had based their appraisal on reproduction of the plant "new" and stated that these amounts would be necessary to put it in that condition. (P.U.R. 1924 B, 138, 177.)

In the foregoing table I have adopted the percentages used by the master as to overheads, depreciation, and going value, and also the master's figures as to working capital. I have some doubt whether 12 per cent for depreciation is not too great, in view of the evidence as to the present efficiency of the plant, my view being that depreciation is something to be concretely determined by inspection, rather than by a theoretical yardstick, and that present efficiency is a very important factor; that even though the life of some of the elements of the physical property will not long continue, yet that this is a matter to be taken care of by depreciation reserve; and that, if the plant is practically as efficient as a new plant, the deduction from valuation on account of depreciation should be very slight. However, there is evidence of some present inefficiency, and I have concluded to allow the 12 per cent in the present case, as did the master. (*Re Wisconsin-Minnesota Light & Power Co.*, 276 Fed. 996; P.U.R. 1922 C, 461, 471.)

The advocates of so-called "straight-line depreciation," which at best is purely theoretical, appear to rely mainly upon the decision in the *Knoxville Water Company* case, 212 U.S. 1, 53 L. ed. 371, 29 Sup. Ct. Rep. 148, handed down by the United States Supreme Court more than thirteen years ago. As I read this decision, it clearly sustains the proposition that depreciation is counteracted by adequate renewals and replacements charged against earnings. While there is language in the decision from which those who contend for the depreciated-value theory in all cases can draw comfort, it does not seem to me that it can be taken as in any way committing the Supreme Court to the doctrine of theoretical accrued depreciation. In fact, such an assumption is directly controverted by subsequent decisions. . . . I conclude, therefore, that there be no deduction from the company's investment in property devoted to the public service, on account of depreciation. (*Re Bronx Gas & Electric Co.*, N.Y. Sup. Ct., P.U.R. 1923 A, 255, 277, 281.)

The extended discussion of depreciation from which the above quotation is taken, and the numerous citations of leading cases which the decision contains, throw much further light upon the subject. Among the other court cases in which deductions for depreciation are rejected or restricted are the following:

Re Pioneer Telephone & Telegraph Co. (Okla. Sup. Ct.), 167 Pac. 995; P.U.R. 1918 A, 465, 471.
Ben Avon vs. Ohio Valley Water Co. (Pa. Sup. Ct.), 68 Pa.S.C. 561; P.U.R. 1918 A, 161, 167.
Re Kansas City Southern Railway Co., 231 U.S. 423.
Re Nashville, Chattanooga & St. Louis Railway, 269 Fed. 351.
Landon vs. Kansas Court of Industrial Relations, 269 Fed. 433; P.U.R. 1921 A, 807, 821.
Re Arkansas Water Co., —— Fed. ——; P.U.R. 1924 C, 73, 107.

There are, of course, contemporary cases in which the courts have held to the older, contrary views, but the forceful and logical

reasoning in the cases quoted does not have its counterpart therein.

COMMISSION PROCEDURE

In general, the decisions of the regulatory commissions for and against deductions for depreciation have to a substantial extent followed the practice laid down in the courts. There have, however, been notable exceptions to such practice, particularly in Massachusetts and California, where the favored procedure has been to use the actual investment in the property for the rate base without deductions. In fact, there have been few exceptions to the general rule that where investment has been so used deductions for depreciation have not been made.

The increasing practice, stimulated by the tendencies of the courts, to give greater weight to cost of reproduction, resulting in a value substantially higher than the investment, has led to deductions for depreciation, which would not otherwise be made, as an offset to so-called appreciation. The lack of logic in this procedure has been pointed out in the preceding chapter. On the whole, there appears to be less tendency on the part of the commissions than of the courts to give consideration to accrued depreciation, and the different points of view of the two classes of tribunals may account for the divergence. The courts are concerned with the protection of the owners of property in their constitutional rights, and it is only the value of the existing property in question which can be so protected. The commissions, in the fixing of rates, are not thus strictly limited in their views as to value, and may properly consider the broader equities of the cases before them.

EXTENT OF DEDUCTIONS IN VALUATION

The extent to which deductions for accrued depreciation are made by the courts and commissions in the cases where deductions are considered varies within quite wide limits, but usually between 10 and 25 per cent, the average deduction being probably not more than 15 per cent. It will later be pointed out that the extent of deductions under the theories by which they are made should depend upon the rate of growth of the properties involved. There have been certain exceptions to the range of findings above stated which may be deserving of attention. When the railway property in Cleveland, Ohio, was valued in

anticipation of the franchise settlement made in 1909, accrued depreciation was found to the extent of 30 per cent, and the franchise subsequently adopted provided that the condition of the property should not thereafter fall below that limit. This is a case in which the upkeep of the property and extension of its lines had been seriously neglected for a long time in anticipation of some settlement of franchise provisions, indicating an unusual degree of depreciation.

In a more recent case involving street railway property in St. Louis the Missouri Commission also found and deducted accrued depreciation to the extent of 30 per cent. In its finding of value, however, this Commission, under a recent ruling of the United States Supreme Court in a case originating with the Commission, felt obligated to recognize present cost of reproduction to the extent of adding 50 per cent to the investment in the property. The deduction of this unusual amount for depreciation in this case, which would not be justified other than by exceptional deterioration of the property, brought the final finding of value back in fairly close agreement with actual investment.

Supplementing the foregoing outline of the history and present status of the subject of accrued depreciation, it may be appropriate to review at this point the common arguments for and against deductions therefor in valuation proceedings. The arguments in favor of such deductions may be stated substantially as follows:

ARGUMENTS FOR DEPRECIATION DEDUCTIONS

Property begins to wear out from the time it is first devoted to public use, and its continued use causes a gradual diminution in value until, when its useful life is ended, its value, other than for salvage, has entirely disappeared. It is assumed that a reasonably accurate estimate can be made of useful life and that the rate at which the value disappears and accrued depreciation correspondingly increases is substantially uniform. It is contended that each customer of a public utility should, therefore, contribute to the exhaustion or consumption of property devoted to his service in proportion to his use of the property, and that, in determining his contribution, uniformity of loss in value may properly be assumed. If each customer actually makes such contribution and the aggregate of these contributions is assembled in a depreciation reserve, this reserve at any time will measure

the accrued depreciation in the property, and when, in conformity to the estimated useful life, the property has been wholly consumed, the reserve will be sufficient to indemnify investors for the loss in value.

As an illustration of the process employed, assume a piece of property costing $1,000 with an estimated useful life of 20 years and a salvage value of $100. At the end of 10 years this property will have a depreciated value of $550, made up of $100 salvage plus $450, one-half the so-called "wearing value" of the property. Uniformity in loss of value is the essence of this theory of accrued depreciation which has been advocated in many cases by those who are interested in mathematical processes or in securing the smallest possible rate base.

Engineers who do not wholly accept this theory of an estimated total useful life and uniform reduction in value throughout have in some cases modified the theory to the extent of examining the property, which is not necessary under the original theory other than to determine the general character of the units employed, the purpose of the examination being to form an estimate of the future usefulness of the constituent elements. The years of such future usefulness, together with the age of the elements in question, determined from company records, give what is assumed to be a more accurate estimate of total useful life and permit a corresponding computation of accrued depreciation.

Still other engineers who reject the theory that useful life can be predicted with the accuracy above assumed have contented themselves by making in appraisals only such deduction for depreciation as is appropriate to take care of deferred maintenance or other factors which cause loss in operating efficiency and possibly with some further recognition of obsolescence and inadequacy already definitely accrued. Such engineers sometimes compute the so-called present worth of existing property elements by determining the total cost, including operation and fixed charges, of performing the same service by new and most efficient obtainable facilities, deducting from this total the cost of operating the existing property in question, and capitalizing the balance at the assumed fixed-charge rate. The assumption is made that the commodity produced is worth only the over-all cost under the most economical production possible and that, to the extent that such cost is exceeded with existing property, value or present worth of this property is less than the cost new of modern

substitute property. The difference between full appraised value and present worth represents the accrued depreciation. Old, but still efficient, apparatus might now show a negative accrued depreciation under this method when compared with new equipment of much higher cost.

ARGUMENTS AGAINST ACCRUED DEPRECIATION

The arguments commonly advanced in opposition to deductions from value on account of depreciation may be summarized as follows:

Public utility property as a whole has unlimited life, and although specific parts of it may wear out or be replaced for other reasons, the property as a whole goes on rendering public service indefinitely, and so long as this service is performed at highest efficiency there should be no diminution in value of the property because there is no reduction in value of service.

To the extent that public utility properties are sufficiently large and their elements are all small percentages of total value, these elements may be permanently maintained and renewed through charges to operating expense without the accumulation of any retirement reserve, and in the absence of such reserve no deduction for depreciation should be made. The accounting methods of the Interstate Commerce Commission are the most definite with respect to depreciation. As they now stand no definite requirements exist as to small units of property, and in tentative plans for revision they are specifically excluded as far as practicable from the property for which reserves are required to be created. This would make deduction for depreciation in value of such units a confiscatory proceeding.

When valuation is based upon the cost of producing an equivalent substitute plant, which, in competitive business, would determine the price of the product as far as it is affected by fixed charges, no deduction for depreciation should logically be made because the substitute plant is new. This basis of valuation of public utility property, as explained in the preceding chapter, is uncommon, but its results in many cases would not differ radically from those under prevailing methods.

When provisions for depreciation or retirements are made on the sinking-fund basis, and the accumulated funds are invested in the property, it is necessary that this part of the total invest-

ment earn a return as well as the property acquired in other ways. If deductions are made for depreciation, the earnings of the retirement fund necessary for its ultimate adequacy would be lacking. Under such methods of accumulating reserves, therefore, no deduction for depreciation should be made.

There is a marked difference between public utility properties and those constructed for competitive enterprises. Factories are frequently constructed to produce some patented article or specialty, the restricted rights in which are limited, and after these rights have expired the special facilities used in production may lose a large part or all of their value. Competition and other economic forces also act in other ways to limit the useful life of industrial equipment. Public utilities, on the other hand, having undertaken essential public service, must continue this service indefinitely. As regulated monopolies they are not required to abandon useful equipment before the expiration of its economic life. In other words, abandonment of specific facilities is not accomplished until it is in the interests of the utility's patrons to pay the added cost, if any, of improved, safer, or more efficient service.

Useful-life Data.—It is pointed out in a preceding chapter on Accounting that the useful life of specific elements of public utility property cannot under present conditions be foreseen with any approach to accuracy. For this reason estimates of accrued depreciation based upon life expectancy are essentially unreliable. Such lack of accuracy, however, would not permit the denial of depreciation deductions if they were justified by other conditions. After a public utility property has reached maturity, the extent of its accrued depreciation, determined in the conventional way, tends to become stable. A "mature" property is one which has reached such a stage that a large proportion of its original elements have been replaced and the process of replacement has reached substantial uniformity. Such stability, arising from the maturity of the property, does not necessarily mean uniformity in the present physical condition of all such properties.

A mature property without growth, having elements ranging between entire newness and the end of usefulness, would have a condition represented by 50 per cent, neglecting the factor of salvage value. Growing properties, however, never reach this condition because the constant addition of entirely new elements ordinarily leads to a per cent condition far above the 50 per cent

limit applicable to a non-growing property. Not only does the per cent condition vary with the rate of growth of the property, but it may vary from year to year, depending upon the extent to which major replacements of property elements are made. It is not clear why the rate of growth of a property or the substitution of important new elements for old ones should affect the rates charged for service, such as would result from the strict application of accrued depreciation theories.

Practical Considerations.—The operators of public utility properties are confronted with certain practical considerations in connection with this problem of accrued depreciation. Many properties for a considerable period of years have failed to earn and accumulate any provisions for depreciation under rates adjusted to yield maximum possible income. The owners of such properties fail to see why the rate base assigned to their properties should steadily decrease from year to year. Other more successful properties have earned and accumulated moderate reserves for depreciation, with the expectation that these reserves invested in the property would earn a return which would aid in the accumulation of more adequate reserves. They do not understand why the value of the property should be so diminished that the earnings of the reserve are cut off. Even with prosperous utilities which have accumulated what the executives consider sufficient reserves, there is always the risk, in a rate case, that accrued depreciation will be found and deducted in greater amount than the reserve created therefor, resulting in a loss to the owners represented by the difference between the established accrued depreciation and the accumulated reserve.

Neither public utility operator nor the average business man sees the logic in rates for the product of an old but efficient plant lower than from a new one similarly situated, which rates would result from a depreciated value attached to the former plant. The business man finds no counterpart in his own experience and sees no fundamental distinctions in public utilities under regulation. It would appear that if two similar utility systems were in competition, one new and the other old, the rates of both being based on cost of service including return upon "present value," the new plant would not get business, except that in excess of the capacity of the old plant, because its rates would be higher.

It is a fact not needing mathematical demonstration that, if straight-line appropriations are made for depreciation continuously from the inception of a project, a reserve will be accumulated in the early years of a non-growing property without salvage value equal to about 50 per cent of the investment therein. This point may be made clear by reference to a simple diagram (Fig. 4) of a hypothetical property without growth, in which the line *OAB* represents broadly, in percentages of total investment, the annual expenditures for retiring or replacing property units. These expenditures, beginning at zero, will gradually increase until the property has reached maturity, after which they will continue with reasonable uniformity for an indefinite period.

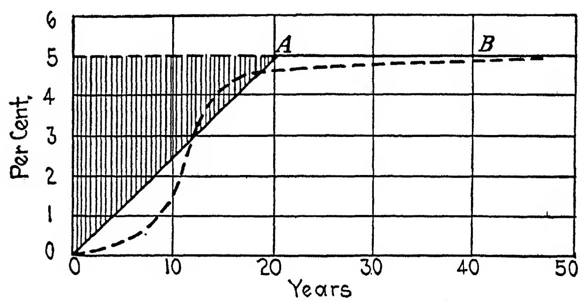

FIG. 4.

If, from the beginning of the project, a straight-line accrual were provided on the basis of an average unit life of twenty years, the entire investment would have been appropriated at the end of that period, but only one-half of that amount would have been used. The remaining half, represented by the shaded area in the diagram, would never be called upon for its intended purpose, other than for minor equalization purposes in connection with irregularity in subsequent renewals, because accruals and expenditures would be equal after the property had reached maturity. In actual practice the line *OAB* would not be straight, having a tendency in the direction of the curved dotted line because of varying life and value of units, but the extent of the unused accumulated reserve would not be materially affected.

Unnecessary reserves are contributed, through rates higher than would otherwise be required, by patrons who, if they understood the circumstances, might well have preferred to pay lower rates and invest the difference elsewhere at a higher rate

of return. In a growing property these reserves would be used to finance extensions which might, for the time being, yield wholly inadequate returns. An analysis of the operations of a typical, well-managed railway for a period of twenty years shows the following interesting results:

Actual retirement requirements amounted to about $1,000,000. The unused balance of the retirement reserve at the end of 1924 was about $1,500,000, or more than 10 per cent of the investment in physical property. There were no important impending retirements and the property was in good physical condition throughout. If a straight-line reserve for accrued depreciation had been set up on the "useful-life" basis the unused balance would have been about $4,500,000, or nearly one-third of the investment in physical property. The charges for retirements during the twenty years are classified as follows:

	Per Cent
Governmental requirements	56
Inadequacy	23
Obsolescence	7
Wear and tear and casualties	14
Total	100

The striking features of the above tabulation are the insignificant proportion of retirements for physical causes, which can be estimated with some measure of accuracy, and the preponderance of non-physical causes (amounting to 86 per cent) which cannot be forecast with any approach to accuracy. In a less rapidly growing property, paving requirements, changes in street grades, etc., included in the first item, might be a somewhat smaller proportion of the total.

Possibilities of Current Provision for Current Depreciation

Those who favor a retirement reserve accumulated through uniform straight-line charges to operation contend that this is the only method under which present customers are specifically charged with the value of property currently "consumed" in the service which they utilize, and that any restrictions on the accumulated reserve or flexibility in appropriations thereto tend to make the current charges for service inconsistent with its cost. This contention is so widespread that it deserves careful

analysis. No one disputes the principle that utility revenues should cover the cost of service or that the rate schedules through which the revenues are derived should be adjusted as closely as practicable to distribute the revenues among classes of service and individual customers in proportion to their several costs.

In practice, such distribution is never wholly attained. Maximum rates for electric and gas service are sometimes fixed below the cost to small consumers, and the deficiencies are made up, if at all, from larger, more favorably conditioned customers. Very large power customers may also pay less than full allocated cost, although more than increment cost. Universally, in the United States, short-distance street-car riders help to pay the cost of carrying long-distance passengers. Flat telephone rates transfer a part of the cost of busy stations to those less frequently used. Furthermore, the total cost of service of any utility in any particular year is rarely, if ever, exactly met by the revenues of that year. The deficiencies or excesses of certain periods are equalized in others through the corporate surplus. It is, therefore, safe to say that no utility customer ever pays exactly for the current cost of his service. This being true, it is obviously futile to attempt extreme refinements in certain cost elements that are impossible in others or in the total cost. When particular costs have their basis in estimates which are subject to large possible or probable errors, the futility of attempting refinement is magnified.

When a stable property has reached maturity, the demands upon reserves for retirements tend to become stabilized, from which it follows that in due time the cost of retiring property units installed many years ago will approximate the cost of the capital "consumed" in the service currently rendered by surviving units. Under such circumstances it is of no concern to a present customer whether his contributions toward the upkeep of the utility property which he patronizes is used to offset current depletion in the many units remaining in service, or to retire a few units which have reached the end of their useful life. The basic argument in favor of the straight-line accrual and reserve fails to meet fully the test of accuracy in its practical application and, if this method is to have continued use, it must be based on other considerations, to which later reference will be made. As properties devoted to public service attain a more extended history and become more mature and stable, the cost of

retirements and the appropriations therefor, by whatever method determined and from whatever source derived, will tend toward greater consistency, and the method of accumulation will have less significance.

RESERVES AS A MEASURE OF DEPRECIATION

The regulatory commissions, in their consideration of the accrued depreciation problem in rate cases, have, in general, recognized the injustice of making deductions therefor without specific consideration of the financial history of the properties involved. They have found that the average public utility fails to earn a provision for retirements in addition to a fair return to investors during its early years, the accumulation of a retirement reserve being gradually undertaken as improvement in business permits. It is, therefore, becoming common practice of the commissions to make deductions for depreciation only to the extent of reserves actually earned for that purpose. This does not necessarily mean to the extent of existing reserves definitely segregated from corporate surplus, because many properties have not yet made such segregation. It is, therefore, necessary for the commissions in such cases to review the financial history of the utility to determine as closely as possible the extent to which provisions for retirements have actually been earned. A study of recent decisions in rate cases shows a pronounced tendency toward this method of solving the depreciation problem.[1] No injustice is involved in this procedure whether the reserves are invested in the property or elsewhere, for investors are assured of a return upon the property which they have created, either by direct return from all of it or by a diminished direct return plus the earnings of reserves invested elsewhere. This may be illustrated by a property into which investors have put A dollars and which has accumulated a retirement reserve R. If the reserve is invested in the property, the rate base will be $A + R - R$. If the reserve is invested elsewhere, the rate base becomes $A - R$, but with an independent investment, R, yielding a supplementary return.

[1] *Re Indiana General Service Co.* (Ind.), P.U.R. 1920 A, 948, 951; *Re Lansing Fuel & Gas Co.* (Mich.), P.U.R. 1921 C, 465, 472; *Re Cape May Illuminating Co.* (N. J.), P.U.R. 1921D, 695, 698; *Re Nassau & Suffolk Lighting Co.* (N. Y.), P.U.R. 1924 A, 96, 104; *Re Chicago Telephone Co.* (Ill.), P.U.R. 1924 A, 213, 230.

In many cases the commissions are confronted with financial history which shows that limited retirement reserves have actually been set up in connection with uniformly inadequate return to investors. The question then arises as to whether or not such a reserve created at the expense of investors should be deducted from property value. Under the development-cost method of determining going value it would be immaterial whether or not such deduction was made, as deficiencies under the full cost of service, whether in retirement provisions or in return to investors, would be restored if depreciation deductions were made.

From a practical point of view, in the light of credit requirements of the industry to provide for expansion of facilities, it would seem equitable to recognize and make deductions for retirement provisions only to the extent that they have been accumulated after fair returns have been allocated to investors, regardless of whether such returns have been distributed or have been retained in a surplus which belongs to the investors. This, at any rate, might be a safe rule for properties with prospects of ultimate prosperity and present ability to take care of actual retirement needs.

Properties without Reserves.—Further cases will be found in which no substantial reserves have been set up beyond current needs because of the inability of the utilities concerned to secure sufficient revenue for the purpose under any permissible or reasonable rates. In some such cases the setting up of even moderate reserves would have left insufficient income for interest charges. While commission decisions are to be found in which such situations are ignored and depreciation deductions made, an increasing preponderance of such decisions favors the views herein urged that no deductions may equitably be made under such circumstances.[1]

EQUITABLE AVOIDANCE OF DEPRECIATION DEDUCTIONS

Consideration will now be given to the general conditions under which deductions for depreciation may equitably be wholly avoided. The sinking-fund method of accumulation has been

[1] *Re Clayton-Glassboro Water Co.* (N. J.), P.U.R. 1922 E, 223, 224; *Re Exeter Water Works* (N. H.), P.U.R. 1923 B, 339, 346; *Re New York State Railways* (N. Y.), P.U.R. 1921 C, 496, 502; *Re Gardiner Electric Light & Water Co.* (Mont.), P.U.R. 1920 D, 821, 824; *Re Webb City & Carterville Gas Co.* (Mo.), P.U.R. 1922 C, 608, 616.

referred to as a procedure not requiring such deduction. Although this method is theoretically correct and applicable to public utility properties, it involves accounting complications and costs which have prevented its general adoption. Its adoption by mature properties, which have previously employed some other system, is particularly complicated, involving the determination of remaining useful life, depreciable value not previously provided for, an equitable rate of interest upon the accumulated funds, and other equally difficult or unstable factors. Not only do sinking-fund accumulations involve complicated accounting, but there are possibilities of serious error with property elements of unusually long life, because the sinking-fund interest accumulations are much more rapid toward the end of the period.

As an illustration of the possibilities of error under such circumstances, a dam for a large hydroelectric project will be assumed. This dam has a low head, was carefully designed for stability, and is located in a territory which history shows has been free from seismic disturbances and which has extensive and stable industrial developments. If it is assumed that this dam cost \$2,000,000 and will last 250 years, the annual contribution to the sinking fund to accumulate the original cost within this period, with interest at 5 per cent, is found to be about \$5 under the sinking-fund formula

$$X = \frac{r}{(1 + r)^n - 1},$$

in which X is the percentage of the investment, r is 0.05, and n is 250. Should this dam for any reason cease to be useful at the end of 200 years, the then accumulation in the sinking fund would amount to only about \$172,000, $\left(\$5 \times \frac{(1 + r)^n - 1}{r}\right)$, leaving more than nine-tenths of the investment unprotected. Under a straight-line basis \$1,600,000 would have been accumulated, and under any other more or less arbitrary basis the accumulation would undoubtedly be much greater than under the sinking-fund method. For elements of comparatively short life the possibilities of error in the sinking-fund method through incorrect estimates of useful life are very much reduced, but serious objections to this method still exist and are fundamental because of its character.

Wisconsin Method.—Such difficulties may be avoided, together with the excessive accumulations yielded by the straight-line method, by a compromise program specifically adopted in a number of cases and applied in effect to many others. This method involves the addition to the retirement reserve, whatever its amount, of the earnings derived from its investment. Such reserves are usually invested in the property and the additions thereto, annual or otherwise, include the earnings in question plus such additional appropriations from surplus as are needed to maintain adequate reserves. This procedure, therefore, requires that the entire property, including that in which the reserve is invested, must earn a return, and, hence, no deduction for accrued depreciation should be made. This method has been endorsed by a number of public service commissions, and its practical application is clearly set forth in the decision of the Wisconsin Railroad Commission in a case of the Duluth Street Railway Company in 1923, involving operation of lines in Superior, Wis., from which decision the following is quoted:

A second method of giving consideration to accrued depreciation, although the effect of such depreciation is not measured by a deduction from the rate base, is to compute the rate of return upon the rate base before giving effect to accrued depreciation, which means that the utility is permitted to earn a return upon all property, including that built from reinvested reserves, and to provide for a credit of interest to the reserve based upon the reserve balance. This, in effect, constitutes a payment of interest to the reserve for the use of reserve capital exactly comparable to the payment of interest on a funded debt. Therefore, when a rate base is determined without giving effect to accrued depreciation in the base itself, no injustice is done to the consuming public as long as the company is required to utilize a proper part of the return which it is allowed to earn upon its total property as a credit to the depreciation or retirement reserve. Such a credit amounting to the payment of interest for the use of reserve capital means that the investors in the utility do not actually get a return upon the total property before giving effect to accrued depreciation but that they get a return after paying interest for the use of reserve capital. In other words, they get a return actually upon property after giving effect to accrued depreciation and no greater return. The result of providing for the credit or payment of interest to the reserve means that to the extent that such interest increases the reserve the necessary charge to operating expenses is diminished and consequently, while the return to be provided, in total, is greater than where the effect of accrued depreciation is considered directly in the rate base, the cost to the customer is not greater because the amount of operating expenses which he has to meet is diminished to the extent that interest added to the reserve makes it unnecessary to charge operating expenses in order to provide the reserve. Therefore, if the provision for depreciation is

made upon a proper basis there is no necessity for giving effect to accrued depreciation directly, in determining the rate base, although to determine value as distinct from the rate base such procedure would probably be required.[1]

It has been stated above that this method has been followed in effect, although not specifically, by many companies. These companies in regular routine account for the earnings of the invested reserves, as well as those from other investments in the property, in their accumulated surplus, and when appropriations are made from this surplus to retirement reserve it may be assumed that the current earnings of the reserve are included in the appropriations, although not specifically designated as such.

This method simplifies rate proceedings to a material extent. The value of the entire property is determined, and the extent of retirement appropriations necessary for the maintenance of an adequate reserve is fixed. The cost of service to be covered by the rates in question would include return on the entire investment, operating expenses, and taxes, and that portion only of the retirement appropriation represented by the difference between its total and the current earnings of the reserve. The results obtained by this process would not in the long run differ to any material extent, if at all, from those under the older methods of deductions from valuation to the extent of estimated depreciation or the accumulated reserves therefor, or from the sinking-fund method when the full reserves which it requires have been accumulated.

Various reasons for ignoring accrued depreciation and its deduction in valuation and rate proceedings have been suggested above, at least some of which avoid injustice to any interested parties and result in simplified and less controversial procedure. It cannot be too strongly urged that some such methods be adopted in valuation and rate cases.

If the compromise method described above and in the *Duluth* case quoted, which embodies maximum simplicity and possibilities of flexibility, is used, the question arises as to the rate at which earnings of the invested reserves shall be computed. The alternatives are the full fair return rate which the property as a whole should earn, or the lower rate at which money is currently borrowed from the bankers or elsewhere for temporary financing.

[1] P.U.R. 1923 D, 705, 737.

The former higher rate might on first thought appear to be the fair one to use because it is the average rate applicable to the property as a whole.

The Wisconsin Commission, however, and some other commissions have adopted a lower interest rate, usually about 5 per cent, presumably because the investment of retirement funds in the property is temporary only, such investment being closely analagous to temporary financing through bank loans, for which lower interest rates are paid. There is further to be taken into consideration the fact that retirement funds cannot always be fully invested in the property either because of lack of construction to which to apply them or because of their premature withdrawal in connection with large-scale permanent financing. Even if the entire reserve were profitably invested, a margin of return for the company would be consistent with the fees conventionally allowed for the administration of trust funds. It must also be remembered that the full normal return enjoyed by the property as a whole is a composite of return from various classes of investment involving varying degrees of security and stability, and if a particular investment is above the average security and stability, it should command less than the average return. For the above reasons the Wisconsin practice of allowing an interest return upon the invested reserves appears reasonable.

Although many of the commissions, as already indicated, have adopted the practice of accepting existing retirement reserves as a measure of accrued depreciation or as the basis of a part of the current additions to the accumulated reserve, as above outlined, this practice has not been accepted as freely by the courts, at any rate without reservations. In certain cases recently taken to the federal courts it has been held that invested reserves cannot be accepted as a measure of depreciation unless investigation has shown that they are closely and properly adjusted for that purpose.[1]

The courts, as has been shown in the preceding chapter, are keenly alive to the shortcomings of present valuation practice, and it is to be expected that procedure initiated by the commissions, which is wholly equitable although not directly consistent with earlier judicial methods, will ultimately have judicial

[1] *Re Monroe Gas Light & Fuel Co.*, 292 Fed. 139; P.U.R. 1923 E, 661, 671; *Re New York Telephone Co. vs. Prendergast*, 300 Fed. 822; P.U.R. 1925 A, 491, 496.

approval to the extent that it brings about simplification without violation of fundamental legal principles.

SIZE OF RETIREMENT RESERVE

It is now in order to consider the size and character of reserves which public utilities should accumulate for retirement purposes. For the time being any further requirements for protection against deductions for accrued depreciation or other factors will be ignored. The preceding chapter on Accounting recommends that a single reserve for all property elements be created without subdivision for different units or classes of property for the sake of simplicity and minimum charges against patrons.

The size of such unified reserve will naturally depend upon the character, condition, rate of growth, and size of the property involved. A property made up of simple units or those not subject to change because of engineering developments may properly have a smaller reserve than a property with complicated elements subject to the effects of obsolescence and other similar influences. A well-maintained property may have smaller reserves than one subject to serious failures or accidents on account of neglect.

A property in a rapidly expanding community is more apt to retire units because they are outgrown or otherwise not suitable for continued service than a more stable property. A large property with many units representing small percentages of the total investment will replace such units more freely through maintenance charges than a smaller property and will, therefore, have less use for retirement reserves. In the general discussion in this chapter, the author has had particularly in mind the comparatively large number of small properties which are subject to substantial fluctuations in income and operate at best under narrow margins of profit rather than the larger, more profitable, and stable properties which may be less concerned over refinements in their retirement accounting and reserve accumulations.

It has been shown that the straight-line method will eventually accumulate reserves theoretically equal to about 50 per cent of the wearing value of a stable property, and that reserves of such magnitude are never required for retirement purposes. A study of carefully prepared appraisals and the rate bases established by commissions for many public utility properties, in

which the extent of accrued depreciation has been determined, indicates an average for well-maintained property of normal growth not far from 15 per cent. It is not probable that expenditures for retirements of this order would normally be made in any one year or even two years. In fact, normal expenditures would ordinarily be far less than 50 per cent of the existing depreciation. Exceptions may, of course, be found in the case of properties having large power developments approaching the end of their useful life and, therefore, requiring unusual accumulations.

Many experienced public utility operators have come to the conclusion that a reserve amounting to not more than 10 per cent of the investment in the property is sufficient to take care of the retirement needs of the present and near future, and that a reserve of 20 per cent of such investment is a liberal provision by a prosperous company for anticipated future requirements and contingencies under reasonably stable and normal conditions.

Regulatory Limitations.—It is significant that a number of regulatory commissions in recent cases have set limits to the extent of retirement reserve accumulations, authorizing the utilities to build their reserves up to these limits and thereafter to make only sufficient appropriations to stabilize the reserve at the designated limit.[1] The limit has been 10 per cent for large properties which can make many renewals through operating expenses without distortion. Assuredly, a deduction for depreciation in excess of actual accumulations within such limits could not equitably be made. It is suggested that commissions which adopt this plan of limited reserves should definitely announce a policy not to make greater deductions for depreciation than the reserves so created. Although such an established policy would not be binding upon the courts in their findings of value, it would undoubtedly be given due recognition.

The fact that there is lack of agreement upon the extent of retirement reserve accumulations indicates that no fixed percentage of investment or other alternative measure of accumulation is necessary or even desirable under all circumstances. The

[1] *Re Consolidated Gas, Electric Light & Power Co. of Baltimore* (*Md.*), decided June 12, 1923; *Re Chicago Telephone Co.* (Ill.), P.U.R. 1924 A, 213, 230; *Re New York Telephone Co.* (N.J.), decided Dec. 31, 1924. See also service-at-cost franchise provisions in Chap. III.

opinions of public utility officials, above referred to, indicate that there may safely be a substantial range in the accumulated reserve within which there is reasonable protection of the investment, with a lower limit representing anticipated needs of the near future and an upper limit making liberal provision for unforeseen as well as anticipated requirements. The reserve may fluctuate between these limits with varying appropriations thereto and expenditures therefrom, depending upon business conditions, without risk to investors or effect upon the service rendered.

RETIREMENT RESERVE AS "BAROMETER FUND"

Such possibilities at once suggested the thought that the retirement reserve might be used as an index to the adequacy of rates or fares similar to the barometer fund provided for in service-at-cost franchises. If, under certain rates, revenues were found to be insufficient to pay operating expenses, taxes, and a fair return upon the property value, and, in addition, to maintain the retirement reserve above the lower safe limit fixed for the property, it would be clear that higher rates were necessary. If, on the other hand, rates were such as to yield not only expenses, taxes, and a full return, but also provisions for retirements in excess of the amounts necessary to build up the reserve to its upper liberal limit, it would be equally clear that rates might be reduced to the extent of the excess earnings available for the retirement reserve.

Such an automatic regulator of rates would have obvious advantages and, if the upper and lower limits of the retirement reserve were wisely adjusted, the property would not be subject to deterioration or loss. There would be the further advantage that retirement appropriations could be curtailed in times of temporary depression, resulting in a possible substantial reduction in the retirement reserve but still keeping it within safe limits to be again built up with restored prosperity—all without the temporary changes in rates otherwise necessary to insure stable return to investors. A plan of this character should not overlook the need of a corporate surplus for stabilization of return and protection of credit. Such a surplus should be created and maintained through a margin in the rate of return discussed in the following chapter.

FLEXIBLE RETIREMENT ANNUITIES

Under such a system of reserve accumulations as above described it is clear that the annual appropriations to the reserve would not be made uniformly on a basis of percentage of depreciable property or in per cent of annual revenues, or as fixed amounts per unit of production. Some such units might be used as a guide to normal appropriations, to be departed from as the extent of the accumulated reserve required. It is suggested that if the basis of such normal appropriations is revenue or units of service, the departure therefrom under varying business conditions will be less than if the normal were a percentage of the property investment.

SURPLUS PROVISION FOR LOSS IN VALUE

Objection may be raised to such limitation of accumulated retirement reserve as is here proposed because of the possibility of regulatory or judicial proceedings in which deductions for depreciation may be made to an extent greater than the existing reserves. It may also be pointed out that public utilities frequently make claims in rate cases for depreciation annuities in excess of the amounts actually appropriated for retirement purposes as shown by company records and annual reports to the commissions. Both these points need attention, particularly the latter, which involves no real inconsistency. It is common practice under modern accounting methods to segregate a reserve for retirements, at the same time retaining in the corporate surplus a further provision for contingencies, including that of a valuation in rate or municipal purchase cases scaled down from the full value by an amount greater than the retirement reserve. In fact, unless or until regulatory and judicial practices have been sufficiently standardized fully to assure deductions for depreciation not in excess of conscientiously determined existing reserves, such further provision for loss should be made, and the corporate surplus is a better place for it than a retirement reserve, the adequacy of which should be tested from time to time by retirement needs and experiences.

Reserves more liberal than those here contemplated are sometimes urged under service-at-cost franchises or other plans involving possible municipal purchase in order to facilitate such purchase by the reduction of the final payment for the property

to the extent of the accumulated reserves. Such procedure confuses retirement requirements and amortization of capital, which should be kept entirely distinct. Today's patrons of a utility which is facing possible municipal purchase should be able to ascertain the extent, if any, to which they are contributing through rates toward such purchase and the effect of their contributions upon subsequent rates.

EFFECT OF PROPERTY GROWTH UPON RETIREMENT RESERVES

It has been stated that the extent of retirement charges and reserve accumulations needed to insure permanent property upkeep, expressed as a percentage of present investment, depends upon the rate of growth of the property. The property units which it is found necessary to retire today may have been installed twenty years ago. The investment in property during that twenty years may conceivably have remained stationary, but is more apt to have at least doubled. If the investment has doubled, the current retirement costs would be only one-half as great a percentage of present investment as for a property without growth.

The relation between the present investment (V) in a particular property and the investment n years ago (v_1), during which period the property has been uniformly growing at a percentage rate represented by i (a decimal), is expressed by the formula $V = v_1(1 + i)^n$. The relation between the present investment and that twice as many years ago (v_2) would similarly be represented by the formula $V = v_2(1 + i)^{2n}$. The relation to the investment at more remote dates, multiples of n, may be expressed in a similar way.

Turning now to retirements, those in any one year would consist of units originally installed n years ago, others renewed for the first time n years ago, and still others which had been previously renewed, assuming for the moment that all units have a useful life of n years. The cost of the units installed in any year would be i times the total investment in the then existing property. The total cost of retirements in any year would be the sum of the costs of units installed or replaced n, $2n$, $3n$, etc. years previous, or $i(v_1 + v_2 + v_3 + \ . \ . \ . \ )$. If these various investments (v) in earlier years are expressed in terms of present investment (V) by the transposed general equation

$v = \frac{V}{(1+i)^n}$, the present cost of retirements becomes $iV\left(\frac{1}{(1+i)^n} + \frac{1}{(1+i)^{2n}} + \frac{1}{(1+i)^{3n}} + \ . \ . \ . \ \right)$, the number of terms depending upon the age of the property. If an unlimited age is assumed, the parenthesis takes the form of an infinite series, each member being less than unity, and the sum of the series is

$$\frac{\frac{1}{(1+i)^n}}{1 - \frac{1}{(1+i)^n}}.$$

To determine the ratio (x) of retirement cost to present investment, the total cost as above expressed is divided by V and the formula becomes, for a property of unlimited age,

$$x = i\,\frac{\frac{1}{(1+i)^n}}{1 - \frac{1}{(1+i)^n}}.$$

Where the age of the property is limited, some of the smaller items in the infinite series would be omitted and the final percentage correspondingly reduced. As an illustration of the above, a property, growing at the rate of 5 per cent per annum and having units lasting uniformly twenty years, will have $\frac{1}{(1+i)^n} = \frac{1}{1.05^{20}} = 0.377$, and the infinite series $\frac{0.377}{1 - 0.377} = 0.605$, and the ratio of replacement costs to present investment $0.605 \times 0.05 = 0.03025$, or 3.025 per cent. This is to be compared with 5.0 per cent for a similar property without growth.

It is obvious that no public utility meets the conditions assumed above, particularly that of uniform useful life of units and, therefore, the formula above developed cannot be directy, applied. If, however, a uniformly distributed useful life within a certain range of year is assumed, a similar analysis may be made. It involves as many different series of computations as there are years in the range of life, each series including a proportionally smaller group of units. Some further approach to actual conditions may be had by assuming greater proportion of value in long-life than in short-life units. It will be found that these and other modifications of the basic formula, including

the limitations on total life of the property, tend to reduce the percentage of present investment required for current retirements below the basic formula rates.

The above very brief and incomplete outline of a method of analysis of retirement costs shows the striking effect of property growth upon the percentage of present investment involved in such retirements. A more complete study of this subject, together with charts and specially prepared tables of factors and the sums of their infinite series, may be found in a paper by the author in the March, 1916 issue of the *American Economic Review*.

LIBERAL RESERVES DURING PROSPERITY

This chapter has undertaken to show that deduction for depreciation in valuation cases has no advantages over alternative methods involving the retirement reserve which avoid controversies and are otherwise simpler. The contention is also made that excessive reserves should be avoided and that uniform or "straight-line" accruals do not have the claimed advantages of precision. It may not be out of order, in closing the discussion, to make certain reservations regarding the extent and method of reserve accumulations. Flexibility in accruals has been urged in the interests of utilities subject, as most of them are, to substantial fluctuations in income. Where such fluctuations do not exist, uniformity may have advantages from an accounting viewpoint.

Other considerations not heretofore discussed may also have a bearing on the amount of the reserve. It is the good fortune of some utilities, of which telephone companies are typical examples, to render service which is worth far more than its cost to many patrons. Other favorably situated utilities may also conduct a profitable business at rates so low as to compare very favorably with similar companies elsewhere. There is always the possibility that wholly unforeseen reverses or radical engineering, social, or economic changes may upset the programs of such utilities, involving large losses in income or radical modifications in facilities or both. Such possibilities suggest the wisdom of ample surplus and liberal retirement reserves. If unusually liberal reserves can be accumulated under rates that are wholly reasonable, in addition to the usual cyclical accumulations in comparatively prosperous years, they should be encouraged

instead of the alternative program of further reductions in rates to exceptionally low levels. The weight to be attached to existing rate levels in determining adequate retirement accumulations cannot be clearly defined but should have appropriate consideration in each case.

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CHAPTER IX

RATE OF RETURN TO INVESTORS

Public utilities under regulation may charge only such rates as are necessary to cover the cost of the service rendered, including among other things a fair return to investors made up of interest and dividends on the funds furnished to establish and develop the property. The literature dealing with regulatory methods contains a vast collection of material concerning valuation, depreciation allowances, and legal principles; also discussions of certain items in operating expenses and taxes, but surprisingly little dealing specifically with the problem of what constitutes a fair return upon the value of utility property.

IMPORTANCE OF SUSTAINED CREDIT

The tribunals have been too prone to follow precedents in this matter instead of analyzing the factors upon which fair return depends, with the logical result in many cases of inadequate rates and impaired credit of the regulated utilities. Upon this credit depends the ability of the utilities to get new money with which to develop their properties to meet the needs of new and expanding business, which needs are more consistently pronounced in the public utility field than in any other. It is, therefore, desirable to undertake an analysis of the factors involved in a fair return in order that essential elements may not be overlooked and others estimated erroneously.

Capital is an extremely fluid commodity, moving with surprising readiness into those fields which offer the highest return for a given risk. Like other fluids, capital will not flow without what is known as "static head," and such head is especially needed to divert capital from accustomed channels into those with which it is less familiar, and, until recent years at least, the major flow of capital has been into railroad and industrial fields. Capital is also proverbially timid, avoiding risks and unknown fields unless they promise unusual returns. It is also quick to abandon fields into which it has ventured and found to be unprofitable.

ELEMENTS IN FAIR RETURN

In a rate case the fair return involves the amount which should be earned in addition to operating expenses, taxes, retirement provisions, and surplus—in other words, the proper gross income after all the above costs have been provided for. Among the items of cost which are embraced in gross income are interest upon funded debt and other borrowed capital, and dividends upon outstanding stock. In addition, gross income should take care of amortization of discount, brokerage, and other expenses connected with financing, to the extent that such costs are not included in the property value, and also a balance for surplus and stabilization of rates. Other than for interest, discount, and dividends, the above items are wholly or in part ignored in many rate cases.

UNIQUE BASIS OF UTILITY RETURN

Public utilities differ from unregulated industries which have a distributable income represented by the difference between the prevailing market value of their product, and the cost of making this product in the particular plant, or plants, involved. The market price is fixed by the "marginal" producers who furnish the final quantities necessary to meet the public demand, usually from costly or inefficient plants. An efficient or otherwise favorably situated plant may show a wide difference between selling price and cost, and earn very large incomes even under normal conditions.

Such industries, however, are particularly subject to business reverses and effects of competition, and their incomes, which may permit a maximum return of 25 per cent or more on the investment, may be changed to deficits by downward swings in the business cycle. It has been seen that public utilities are less subject to income fluctuations than other business, but it is, nevertheless, necessary for stability of income distributions either to make frequent rate adjustments or to allow sufficient margins in rates to take care of ordinary fluctuations.

PROBLEM OF COMMISSIONS

More specifically, it is the problem of the regulatory commissons to determine a percentage to be applied to the rate base,

also fixed by them, which will yield a distributable income sufficient freely to attract capital to the business in competition with other needs for capital which in the aggregate far outweigh the needs of the public utility group. This means that all classes of capital necessary to give a properly balanced financial structure should be considered. Not even in periods of ordinary business depression should public utilities be expected to do their necessary financing wholly through bond issues with comparatively low yields, but consideration should also be given to junior financing at comparatively high yields because of the greater risks assumed.

GENERAL VIEWS OF COURTS AND COMMISSIONS

Courts and commissions have recognized the general needs of stability, credit, and adequate income for public utilities, as is shown by the following extracts from representative decisions:

A public utility is entitled to such rates as will permit it to earn a return on the value of the property which it employs for the convenience of the public equal to that generally being made at the same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding risks and uncertainties; but it has no constitutional right to profits such as are realized or anticipated in highly profitable enterprises or speculative ventures. The return should be reasonably sufficient to assure confidence in the financial soundness of the utility and should be adequate, under efficient and economical management, to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties. (*Re Bluefield Water Works & Improvement Co.*, 262 U.S. 679; P.U.R. 1923 D, 11, 20.)

It has been held that no rate of return can be deemed reasonable which is not high enough to attract capital to the form of investment involved in utility properties, such as complainant's. (*Re Alton Water Co.*, 279 Fed. 869; P.U.R. 1922 E, 623, 628.)

There is a hazard attached to a utility investment which has no guaranty of a return, that does not attach to a well-secured real estate mortgage, and it is entitled to a return to compensate it for that risk . . .

In addition to the normal hazards of business a utility has over it at all times the risk that some State or Federal Commission may make a mistake and compel it, for a time at least, to operate at a loss. (*Re Southwestern Bell Telephone Co.* (Kan. Sup. Ct.), 223 Pac. 771; P.U.R. 1924 D, 388, 469.)

Again, telephone companies must grow on an ever-increasing scale in order to meet the demands of the public for service. Under the theory that only a fair return is permitted upon the property used and useful in giving public service, the utility must make extensions out of new capital. Unless money representing the investment in the property already made is earning

a reasonable rate of return, commensurate with the going rate for money invested in property of approximately like risk, new money cannot be obtained. (*Re Mountain States Telephone & Telegraph Co.* (Utah), P.U.R. 1922 E, 293, 313.)

. . . a state regulatory body could do no greater harm to a community so entirely dependent upon the service of a street railway company as the public of Baltimore is dependent upon the service of the respondent company, than to refuse to permit it to charge such rates for its service as will enable it at all times both to command the investment of money necessary for the making of required extensions and continued maintenance of its property in efficient condition and also to render such character of service as the needs of the community reasonably require. So, to refuse would not only be to render it physically impossible for the company to render adequate service, but would also be to drive the company itself into a position of pecuniary decrepitude which would in the end result in bankruptcy and dissolution, after a long-drawn-out period of such inadequate service, during which the property and equipment would fall into a condition of disrepair which could only be corrected after the lapse of many years and the expenditure of many millions of dollars. (*Re United Railways & Electric Co.* (Md.), P.U.R. 1919 C, 74, 89.)

THE RISK FACTOR

The return obtained from any investment includes the two factors of interest and insurance. No known investments are entirely free from the risk covered by the insurance item. It may be contended that government bonds, such as those of the United States, are measurably free from risks, and this may be true with respect to regular payment of interest and ultimate return of the dollars invested. These dollars may, however, have an entirely different value when paid than when loaned. The dollar of today has a purchasing power of only about 65 cents as compared with the dollar of ten years ago, and every long-term investor should make some allowances for changes in the value of money during the period of the investment.

Aside from such risks, some United States bonds are a fair measure of a bare interest rate, in spite of the demand for them from large investors who seek non-taxable incomes. Other government bonds are in special demand for banking reserves, trust funds, etc., and their yield is not representative of true interest rates. United States bonds now in the hands of the general public yield approximately 4 per cent. Bonds of its political subdivisions yield materially higher rates because of a larger element of risk, the ordinary maximum being not far from 5 per cent. Bonds of other countries command still higher

rates, and during the war period non-combatant but stable and conservative nations like Switzerland paid more than 8 per cent for borrowed money.

INTEREST RATES NOT A MEASURE OF FAIR RETURN

No such yields on borrowed money are a measure of the fair return of a public utility enterprise. Neither are real estate loans, which yield from 5 to 7 per cent, depending upon their characteristics, but which are conventionally limited to 50 per cent of the value of the property involved. Underlying issues, particularly closed mortgages of railroads and other corporations, may show yields of not more than 5 per cent because of the low risk incident to their small part in the capitalization and income requirements of the properties.

Dividend requirements on the equities must be considered in determining a fair return on the property as a whole, and many industries show dividend disbursements amounting to 20 per cent on the par value of their stock. A specific illustration of liberal return is found in the case of a prominent rubber company which in 1920 offered its stock at $100 per share. During the preceding dozen years the company had declared stock dividends of 100 per cent on four occasions, and others of greater and lesser amounts; so that a cash dividend of 12 per cent in 1920 upon stock that had been held continuously throughout this period amounted to 576 per cent upon the original investment. This showing of this company, however, is not typical and will not be fairly stated without recognition of its subsequent financial embarrassment.

COMPOSITE CHARACTER OF RETURN

It is obvious from the above that the return which the conventional public utility distributes to its investors is a composite of interest on outstanding bond issues and short-term loans, and dividends upon its preferred and common stock—all paying different rates of return and having different risks as well as different weights in the capital structure. It is possible to show the weighted average return from these various investments for a typical company. The following figures are given for a simple financial structure, including only one issue each of bonds, preferred, and common stock at yields which, while showing

reasonably proper relation to each other, are not intended to represent any particular period of time or market conditions:

Class of security	Per cent of total investment	Yield, per cent
Bonds	60	6.5
Preferred stock	15	8
Common stock	25	10
Total or weighted average	100	7.6

The weighted average yield of 7.6 per cent, shown above, must be supplemented by further allowances referred to later before arriving at a fair return percentage.

EFFECT OF VARYING PROPORTIONS OF BONDS

It has been stated that yield varies with risk, and it might be assumed that the fair return percentage could be reduced by decreasing the proportion of bonds in the total capitalization, thereby reducing the yield thereon, and also that on the junior issues because of the increase in equity and dilution of risk. It will be interesting to see the effect upon the average yield of such a change in the capital structure, the figures, as in the preceding illustration, representing only approximate relative accuracy:

Class of security	Per cent of total investment	Yield, per cent
Bonds	50	6.25
Preferred stock	15	7.75
Common stock	35	9.50
Total or weighted average	100	7.62

The effect of an increase rather than a decrease in the proportion of bonds is illustrated by the following table:

Class of security	Per cent of total investment	Yield, per cent
Bonds	75	7
Preferred stock	10	8.5
Common stock	15	12
Total or weighted average	100	7.9

If the above figures are relatively correct, it appears that the average yield is higher as the result of both decreasing and increasing the proportion of bonds outstanding from the original assumed 60 per cent, with corresponding increases and decreases in stock issues. This showing is in accordance with the conclusions of various students of financing, but is not universally accepted. It is apparent that, in any of the cases assumed above, an 8 per cent rate for fair return would not be excessive after allowing for other necessary items.

RETURN MEASURED BY YIELD ON CAPITAL STOCK

It may be claimed that such a process of determining fair return is unnecessary because there is available a substantial number of utilities which are financed wholly, or substantially so, by capital stock issued under close commission supervision, the yield on this stock, therefore, representing directly the fair distributable return which is sought. Utilities financed solely through capital stock are common in New England, particularly in Massachusetts where overcapitalization does not exist, but the yields from such stock should not be taken as a measure of fair return without qualification.

Massachusetts Experience.—A study of market reports will show that a considerable number of Massachusetts utilities, paying 10 to 12 per cent dividends, are quoted at over $200 a share, showing yields from 5 to 6 per cent. In the first place it should be pointed out that these market quotations are for sales in small lots by one person to another and would not hold in the case of large offerings by the issuing company. Furthermore, these companies have habitually declared extra dividends, frequently running from 3 to 5 per cent in addition to

the regular rates. A still further allowance should be made for the value of "rights," considered more in detail later, which are frequently equivalent to an average of 2 or 3 per cent added to the yield otherwise secured.

A study of the stock issues authorized by the Massachusetts Department of Public Utilities during the sixteen months ending Mar. 31, 1923, covering roughly $20,000,000 of par value, shows an average yield on the issue price of 8.0 per cent, the figures of individual companies ranging from 7 to 12 per cent. A large part, but usually not the whole of additional stock issues, is taken by existing stockholders. To the extent that existing stockholders exercise their rights to buy additional stock at less than market quotations, the yield which they actually secure is greater than that indicated above. It must further be taken into consideration that dividends from Massachusetts corporations are exempt not only from normal federal income tax but also from the state income tax, amounting to 6 per cent, and to an unusual degree Massachusetts public utilities are protected from the menaces of competition. When all these factors affecting the securities of Massachusetts utilities are taken into consideration, the resultant yield will be found fully as high as that shown in the preceding examples of composite capitalizations.

VARIATIONS IN INTEREST AND DIVIDEND RATES

It has been stated that the illustrative yields above given do not represent any particular financial conditions or period, and no effort will be made herein to present specific figures for the present or previous periods because of wide fluctuations from time to time, especially during and since the World War, and the further substantial differences due to remoteness from or proximity to financial centers. Although at this time interest rates have fallen to an exceptionally low level, it is not to be expected that they will so continue, for reasons that will later appear. It will be sufficient here to indicate in a general way the range of yields from standard securities of different classes which are consistent with the present level of prices, taxes, and other pertinent factors:

	Per Cent
Bonds	5.5 to 7
Preferred stock,	6.5 to 9
Common stock	7.5 to 12

Neither the maximum nor minimum figures in the above table should be combined in an effort to secure a fair return rate because the minimum figures of interest may be associated with comparatively high yields on equities in a particular case, or the reverse may be true. A study of public utility issues in 1923, including more than $1,000,000,000 of bonds and notes, showed an average interest yield of 6.06 per cent. This included all classes of public utilities. The lowest yield applied to water companies, 5.40 per cent, and the highest to gas companies, 6.41 per cent; combination railway and electric companies yielded 6.34 per cent; and combination gas and electric companies 6.20 per cent.[1] Chapter XII includes a discussion of the effect on bond yield of the ratio of gross income to interest requirements and a chart showing the rapid increase in yield when this ratio is low. Yield curves for junior securities would have a somewhat similar form.

History of Bond Yields.—The question may be asked as to why the yield upon invested capital shows such radical changes as recorded history has shown. The wide fluctuations have occurred in connection with changes in price levels or money supply, business depressions, and other significant influences. Capital is devoted to the production and distribution of commodities, and is invested in raw materials, finished products, or the instruments of production—all of which fluctuate in value under the well-known law of supply and demand. In accordance with this law, an excessive supply brings about low prices in order that the excess may be disposed of; a limited supply causes high prices because people will pay these prices to satisfy their needs.

COMPARISON OF FAIR RETURN WITH INTEREST RATES

A prominent engineer and author[2] has made a study of wholesale price levels and bond yields for a considerable period of years, and has come to the conclusion that, aside from a lag in yields as compared with commodity prices, there is a fairly definite relation between the two, which he has approximately expressed by the formula: $i = 0.5\sqrt{p}$, i representing the yield in per cent and p the United States Bureau of Labor Statistics

[1] *Elec. Ry. Jour.*, May 31, 1924, p. 841.

[2] GILLETTE, H. P., *Eng. & Cont.*, June, 1924, p. 1329.

index of wholesale prices with 1913 equal to 100. This formula obviously gives a yield of 5 per cent in 1913, and at the present time about 6.30 per cent. A bond which in 1913 yielded 5 per cent would presumably be rated in the Aa or A class. The present yield on public utility bonds of such rating is somewhat lower than that determined by the formula.

It should be pointed out that the fair return herein considered does not vary directly with the interest rate for various reasons. Changes in normal federal income tax rates which directly affect corporate bond yields do not apply to dividends. Surtax rates, of course, apply to both. Offerings of public utility issues of different classes are not commonly made simultaneously by any one utility. Bonds and other callable obligations are sold during periods of restricted credit, and junior issues are sold in times of good business. The same situation exists with respect to all utilities during succeeding periods of depression or prosperity, each such period having its appropriate issue, and all resulting in a stabilization of the rate of return as compared with prevailing interest rates.

EFFECT OF INCOME TAXES

The federal income tax during and subsequent to the World War has had a marked effect upon money rates. Those having money to invest have naturally sought to increase their gross yield to such an extent that their net yield, after payment of income taxes, would remain undisturbed. This has been possible in the case of small incomes, but where very large incomes are involved it has been impossible, and the result has been to drive investment funds from industry, where they are subject to taxation, into tax-exempt securities. Such restriction of available investment funds has naturally tended to increase rates. The effect of income taxes in removing large investors from the industrial field is shown by government statistics. These statistics show individual federal income taxpayers having yearly taxable incomes of $1,000,000 or more in the following decreasing numbers since 1916, before the appearance of surtaxes:[1]

1916	206	1919	65
1917	141	1920	33
1918	67	1921	21

[1] Statistics of Income for 1921, U.S. Treasury Dept., p. 18, 1923.

In 1919 the taxable income of these persons amounted to $152,000,000; in 1920 it was reduced to $77,000,000. In 1916 taxable incomes from individuals having more than $300,000 per annum amounted to $706,000,000; it was reduced in 1919 to $314,000,000. Subsequent reports show increases in numbers of large incomes and amounts of taxes, due to reductions in tax rates or improvement in business conditions. Not only has such striking diversion of investment funds from productive fields to unproductive federal, state, county, or municipal undertakings increased the yield demanded from the remaining available funds under the law of supply and demand, but there has also been a further increase because the comparatively small investors, whose incomes are not taxed sufficiently to prevent their use in industry, are demanding higher yields because of the limited scope of their investments and their demand for greater insurance than investments on a larger scale would exact.

Tax-exempt Securities.—The extent of investments in the United States in exempt or partially exempt securities has been estimated to be in excess of $30,000,000,000 and such investment has been increasing in recent years at the rate of nearly $1,500,000,000 per annum in government issues, plus short-term farm loan and credit issues of substantial proportional amounts. The funds secured by governmental agencies through this rapid increase in tax-exempt bonds have been used in large measure to provide public buildings, parks, and other improvements which have not been demanded by public welfare but have been encouraged by the widespread demand for non-taxable bonds. The fact has been frequently overlooked that the interest and amortization requirements of such issues are a part of the cost of government to be covered by taxation which rests more and more upon citizens of small income.

There has, however, been a recent demand that the flood of tax-exempt issues be curtailed in order that industry may again command the capital necessary for its expansion in keeping with population growth and world demand for commodities. The removal of the exemption from federal taxes of bonds of states and political subdivisions will require a constitutional amendment, the adoption of which involves many difficulties. Significant steps toward reduction of federal income taxes, including surtax rates, have already been taken and will doubtless be continued in an effort to reduce governmental costs and to restore

the funds of large investors to industrial undertakings, but further radical reductions in surtax rates are necessary before this can be accomplished.

Yield Required to Compete with Tax-free Issues.—In order to show the yields from taxable corporate investments which are necessary to compete with those from non-taxable government bonds, Fig. 5 has been prepared, based on 1924 rates applicable to 1923 income without the 25 per cent temporary reduction authorized by the Congress. This chart shows the

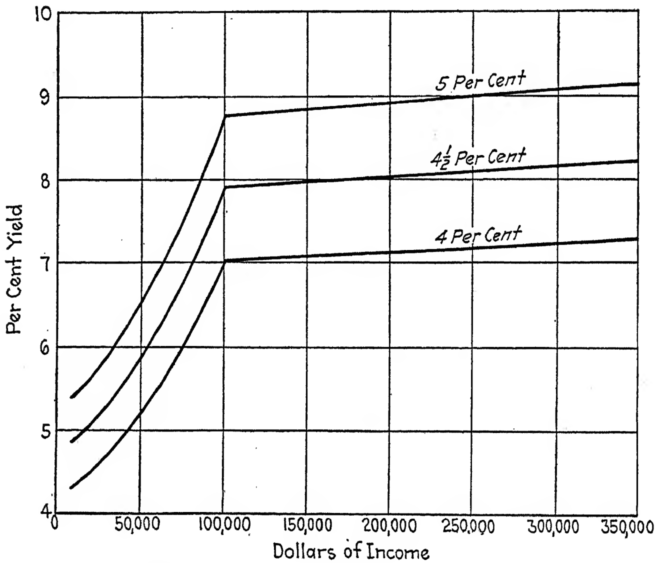

FIG. 5.—Yield required from taxable income to equal return from tax exempt bonds of various yields. The assumed taxable incomes are the margins in excess of the plotted incomes, and the full 1924 federal rates are used.

yield from corporate bonds required to compete with government issues yielding 4, 4.5, or 5 per cent after payment of taxes by investors having incomes up to $300,000 a year, beyond which limit the surtax rate increases only 1 per cent. This chart assumes that the investment to be made in either taxable or non-taxable bonds is the increment of income in excess of the plotted amounts, this being the problem with which the investor is confronted, and does not consider the average tax upon all income.

It appears that an investment of the increment of annual income over $100,000 must yield over 8.75 per cent from taxable

securities in order to compete with government issues yielding 5 per cent. Such a yield is not obtainable from safe corporate bonds, and so comparatively little borrowed money from investors of this size can be expected in industry. Even incomes of $50,000 a year require a yield of more than 6.5 per cent to compete with 5 per cent government issues, and so long as attractive government issues with such yields can be obtained, little money can be expected from this class of investors.

Even with the present downward tendency in yield from government issues and the continuation of the 1924 arbitrary 25 per cent reduction in income tax, or its equivalent, it is not to be expected that corporate investment funds will be freely offered by persons with incomes materially in excess of $50,000 until a still further reduction in surtax rates is made. Under previous higher surtax rates, the limit of incomes from which corporate investments could be freely expected was materially lower, approximately $35,000 as compared with the $50,000 above.

These data are given to show the necessary effect of income taxes upon the cost of money for corporate purposes. High cost of money, particularly for public utilities having necessarily high capitalization as compared with other industries, means higher cost of product or service. This higher cost includes, in effect, the payment of income taxes by utility customers for persons of large income who have themselves avoided such taxes through investment in government securities.

RETURN AFFECTED BY RIGHTS

The effect of "rights" upon the direct yield to stockholders has been briefly referred to above as explaining the comparatively low dividends with which such stockholders are satisfied. It is the usual practice of profitable corporations, the stock of which is worth more than par, to offer new issues to existing stockholders either at par or at a price substantially below the market. This practice involves no injustice because the proportion of equity held by any stockholder is not affected by the number of new shares issued pro rata, and the number of such shares necessary to yield a given amount of money will vary inversely with the offering price. If an existing stockholder does not care to increase his holdings, he may sell his rights to other investors who

may then purchase the stock at an offered price instead of the market price.

Theoretically, the value of rights is found by dividing the difference between market and offered prices by the number representing the ratio of existing plus new shares to new shares. Taking a specific illustration, a company having stock with a market value of 195 plans to issue new stock to the extent of one share for each outstanding four at a price to existing stockholders of 165. The value of the rights is, therefore,

$$\frac{195 - 165}{4 + 1} = 6.$$

The theoretical value of the rights thus obtained is not actually found in sales of rights because of the usual tendency of market prices to decline when large increases in capital are made. The specific figures given in the illustration are representative of Massachusetts practice. It is not uncommon elsewhere to offer additional stock to existing stockholders at par regardless of a higher market price.

A study of typical Massachusetts corporations shows that rights have yielded returns equivalent to 2 per cent or more of dividends. One company averaged 2.25 per cent for a period of fourteen years and 2.5 per cent for the final five years of that period. A rapidly growing company in another state, issuing new stock to existing stockholders at par, has averaged about 3 per cent for a period of ten years. The effect of rights upon total yield obviously depends upon the rate of growth of the property, and stockholders are furnished an incentive to authorize reasonable expansion of facilities.

OTHER FACTORS IN FAIR RETURN

We now come to a consideration of other factors entering into the fair return of a public utility property. The first item is brokerage, which, as already pointed out, must carefully be distinguished from discount. Discount is fixed by the ratio of nominal return on the par value of an issue to the actual yield required by investors, and may obviously be changed by increasing or decreasing this nominal return.

Brokerage.—Brokerage is independent of either the nominal return or the yield but is based upon investment market conditions, the specific character of the securities offered, and other

factors affecting the investment banker's costs of carrying on his business. Brokerage, or cost of financing, as it is sometimes called, includes not only the costs and profits incident to the sale of security issues but also in many cases the risks and responsibilities for such sale where investment bankers purchase the issues outright in order that the utility may be assured of its necessary funds. The risks so assumed include that of a sale at prices sufficiently above the purchase price to cover not only the necessary selling cost and profit but also carrying charges on their own capital until the sale has been completed.

It has sometimes happened that market conditions have suddenly changed to an extent necessitating the carrying of issues so purchased for a considerable time before they could be disposed of to advantage. Selling costs include salaries and commissions of agents, their education in the characteristics of each issue handled in order that investors may be fully informed, advertising, financial circulars, administrative and other overhead costs, and the expert and legal investigations of the properties which are necessary before a reputable banker will purchase any important new issue.

A prominent investment banking house recently prepared a statement of the time required to investigate a large public utility before an issue of its bonds was purchased for distribution to investors. This investigation covered engineering, accounting, and other features, and involved the following expenditure of time:

	Man-days
39 executives	259
29 engineers, statisticians, and accountants	409
41 stenographers and clerks	333
109 persons	1,001

Selling Syndicates.—For large issues it is not customary for any one banking house, however large, to undertake the sole responsibility of purchase and distribution. A syndicate is, therefore, organized with a number of participating members, often running from six to fifteen, who share the responsibilities of distribution through not only their own organizations but also widely scattered agencies. An interesting illustration of such procedure was the sale of $230,000,000 of joint bonds of the Northern Pacific and Great Northern Railways in 1921. Over

1,000 investment banking houses were involved in the sale of these bonds to nearly 50,000 individual subscribers at a cost of about 5 per cent of the par value of the issue. Even in such smaller issues as the $100,000,000 6 per cent bonds of the Anaconda Copper Mining Company sold in 1923, over 900 dealers were involved.

The sales efforts necessary to market corporate issues have materially increased since the advent of high income taxes and the withdrawal of large investors from the market. Although formerly sales averaged from $10,000 to $15,000 per customer, the present average has been reduced to $3,000 or less. For public utility issues this means the education of many new investors of moderate means in the advantages of public utility securities, with correspondingly increased selling costs.

Fees.—The fees charged by investment bankers for their services in connection with long-term securities ordinarily lie between 4 and 7.5 per cent, depending upon the responsibilities assumed and the character of the issue, the higher rates naturally applying to new, unknown, or comparatively unstable properties, and to fluctuating market conditions. During the war disturbances 10 per cent was not unique and was justified by the exceptional efforts necessary to secure capital under the highly competitive conditions then prevailing. Assuming 5 per cent as a normal brokerage fee and twenty years as the average life of the issues sold, the fee is equivalent to 0.25 per cent per annum figured on a straight-line basis, which, in accordance with standard accounting requirements, must be provided from income. On coupon notes running for less than five years this fee would involve an annual cost of more than 1 per cent. Ordinarily, however, the fees for selling short-term issues are less than stated above for long-term securities.

Cost of Customer Sales.—The customer-ownership movement in recent years yields some interesting data on the cost of selling securities, largely stock, by public utility companies direct to their patrons. The average cost of such sales, as shown by a survey made in 1923 involving 75 companies, was $4.39 per share.[1] It is probable that this figure does not include all administrative costs and overheads properly assignable to the sale, and in no case did the selling organization have such responsibility or risk as bankers assume in outright purchase of entire issues.

[1] *Proc. Nat. Elec. Light. Assn.*, 1923, p. 218.

If a local organization should fail in selling sufficient securities to take care of construction requirements, investment bankers would doubtless be called upon to take care of the deficiency.

Advantages of Permanent Banking Connections.—The practice of public utilities and other corporations in marketing their securities regularly through certain investment banking houses has sometimes been criticized. The alternative plan of submitting proposed issues to a number of bankers for bids might, for the time being, reduce somewhat the brokerage cost, but in the long run the time required to educate a series of banking houses in the history and characteristics of a particular company, which necessarily is a part of selling expenses, would be avoided by continuous dealing with one banker who kept informed regarding the properties which he represents. Such bankers are also concerned with the maintenance of a continuous market for the securities of the companies they represent, which would not be the case of a banker handling a single issue with no prospects of continued association with the issuing company. Such a market serves to keep a utility before investors and facilitates the distribution of new issues. Sustained relations with an investment banker also make it possible to market securities at times and under credit conditions which would not attract independent bankers. This continuous interest and undertaking to purchase and market securities under adverse circumstances is often of very great value, and fully offsets the possibly higher fees which the regularly retained bankers may charge on normal issues.

Legal and Other Expenses.—In addition to brokerage, there are other direct expenses incurred by a corporation having an issue of securities to be marketed. These expenses include legal fees of their own attorneys in preparing the necessary papers, the fees of attorneys representing the trustees appointed in connection with bond issues, which fees may aggregate anywhere from $1,000 up to $25,000; the engraving of plates for bond or stock certificates, costing from $2,500 to $4,000, the latter covering the full engraved tint required for listing on the New York Stock Exchange; printing of bonds or certificates from the plate, costing from 25 to 65 cents per piece, depending upon the number and character of pieces; certification of trustees at a cost of from 25 to 50 cents per piece, depending upon the face value thereof; printing and recording of mortgages; fees for filing with the state authorities, usually the secretary of state; fees for authorization

by public service commissions, required in a few states; fees for approval by so-called "blue-sky" commissions, usually small in amount; revenue stamps required to be affixed to the issued securities; and Federal and state income or other taxes assumed by the issuing corporation as an incentive to purchase. The total of these direct expenses is not a large proportion of the par value involved but their amortization may require one-fourth to one-half of 1 per cent where new issues of stock or bonds are involved. It is again pointed out that the above scheduled financing costs must be taken care of either as an element of value or as a factor in cost of service, but duplication of provision therefor should be avoided.

Surplus.—The final factor to be considered in connection with the rate of return is surplus. Public utilities need corporate surplus primarily for two purposes: stability of return to investors, and maintenance of credit sufficient to make their security issues attractive. Income is never wholly stable, and rates for service cannot be adjusted with sufficient promptness uniformly to meet the requirements of a fair return. The maintenance of such stable return is important and tends to reduce the average cost of money. Public service commissions have frequently told public utilities that sought increased rates during periods of general business depression that they should be satisfied to share in the reverses which have overtaken their customers. These commissions in times of prosperity are apt to restrict the utilities to a current fair return without the margin necessary to make up for prior deficiencies or to provide for the accumulation of any material surplus for the future.

Aside from the margin of income needed to stabilize distributable return, there is need of a substantial accumulated surplus to insure the sustained credit of the company, particularly in connection with the marketing of its junior securities. The return appropriate for accumulation of surplus is not necessarily wholly in excess of the fair distributable amount, for conservative stockholders frequently leave a part of the return earned and belonging to them in the corporate surplus to strengthen the equity of the property. It is, however, desirable that a reasonably prosperous public utility accumulate at least 10 per cent of its investment in property as a surplus, this surplus being set aside in prosperous years to the extent of 10 per cent or more of the current distributable income to which investors are entitled.

Surplus Essential to Credit.—As with retirement reserves, existing rates may properly be a factor in determining the extent of accumulation, and where a liberal surplus can be built up under rates that are wholly reasonable and compare favorably with other similar properties, it should be encouraged to the extent of 20 per cent or more of the investment in the property. The effect of such accumulation, as already pointed out, is to improve the credit of the company, reduce the risks of curtailed or interrupted return, and to lower the average cost of money, which, in turn, permits lower charges for service. It is not improbable that in the long run liberality in provisions for surplus, requiring for the time being slightly higher rates than would otherwise be necessary, will permit such future reductions in rates that the average would be lower than if rates were held closely to those required to meet only current requirements to the exclusion of surplus. Where possibilities of competition exist it is logical to accumulate a larger surplus than where regulation protects utilities from such competition. This is another reason why monopoly operation of public utilities is more economical than competition.

The foregoing discussion has pointed out a method of determining the fair return on public utility investments, based upon investment or capitalization, assuming that they are closely related to actual value. This is not always the case. Under present economic conditions value or the rate base is commonly held to be in excess of investment, but the reverse may be true at other times. Capitalization may also be greater or less than the rate base. What is sought is a rate of return applied to the rate base which will attract new capital freely to the enterprise in any form that may be needed.

FAIR RETURN DERIVED FROM BOND YIELDS

It will be of interest to consider other methods which have been proposed for determining the fair rate of return to public utilities. One such method assumes that the fair return is 50 per cent in excess of the interest rate applicable to normal borrowings of the company in question. Officially, this method has been adopted in the Federal Water Power Act, under which the Federal Power Commission licenses and supervises the development and operation of hydroelectric projects wholly or in

part on government domain. The act and supplementary regulations[1] provide that the fair return, through which is determined the extent of excess profits (a portion of which is set aside for amortization purposes), shall be 50 per cent in excess of the weighted average interest rate on outstanding obligations under normal financing plans. If, however, the outstanding obligations represent less than 25 per cent of the actual investment in the project, the fair return rate is fixed at twice the legal rate of interest in the state in which the project is located.

Several of the state commissions have adopted a similar method under emergency conditions or pending the formal determination of fair value.[2] A modification of this method is also found in the Canadian Water Power Act, which has similar purposes to the United States Act. The Canadian Act fixes the fair return at double the interest rate on Canadian government bonds currently issued at the time of granting the license.[3] Either of these well-considered methods may properly be used as a check against other methods of determining a fair return. The formula above referred to for determining the relation of bond yields to wholesale price level might be used with the addition of another factor to relate fair return to price levels. Such a formula would have the approximate form $R = 0.75\sqrt{p}$. For reasons already pointed out the relation between interest rates and price levels is not wholly constant, and this formula cannot be used for other than rough checks.

It may be of interest to note that a recent service-at-cost franchise, agreed upon between officials of the City of Milwaukee and The Milwaukee Electric Railway and Light Company, but rejected by referendum on Apr. 7, 1925, provided a normal rate of return of 7.7 per cent (this being a weighted average between 7.5 per cent for railway and 8 per cent for electric and other operations previously established by the commission), with increase or decrease equal to one-half the actual changes in the prevailing interest rates on company indebtedness from an assumed base of 5.7 per cent. If, for example, the basic interest rate increased to 6.1 per cent, the fair return rate would become 7.9 per cent.

[1] Federal Water Power Act, 1920, Sec. 10*d*; Reg. 17, Sec. 3*A*.

[2] *Re United Railways & Electric Co.* (Md.), P.U.R. 1920 A, 1, 64.

[3] 9–10 George V, chap. 19, Sec. 48 (13).

SERVICE-AT-COST FRANCHISE PROVISIONS

Further reference to the rates of return embodied in other service-at-cost franchises may be appropriate in this connection as indicating an agreement, voluntary to a large extent if not wholly, between utilities and city officials as to a proper rate of return in the localities involved. A number of these franchises include the actual cost of money represented by interest or dividends as a part of the cost of service; others have a basic rate of return plus a share in supplementary profits, making it impossible definitely to determine the expected average rate. In a number of other cases, however, the rate of return, with or without adjustment for efficiency of operation, is definitely stated. Among these franchises are the following:

Cleveland Railway Company, granted in 1910; provides a 6 per cent dividend upon the capital value other than that represented by certain indebtedness, the actual interest on which is allowed.

Dallas Railways Company, 1917; provides a basic return of 7 per cent, with adjustments for changes in rate of fare up to a possible maximum of 9 per cent.

New York State Railways (Rochester) 1920; provides rates of return varying between 6 and 8 per cent according to the rate of fare in effect.

Houston Electric Company, 1920; franchise draft agreed upon between the city commission and the railway but not put into effect; provided a basic 8 per cent return with an increase in return of one-fifth of 1 per cent for each stipulated schedule of fares lower than 7 cents cash with three tickets for 20 cents as an incentive to increased efficiency.

Grand Rapids Railway Company, 1922, provides 8 per cent as a base rate of return, with an adjustment up or down of one-fourth of 1 per cent for each stipulated fare schedule above or below 10 cents cash, with seven tickets for 50 cents.

Fresno Traction Company, 1922; adopted a uniform 8 per cent return by agreement between company and city; approved by the California Railroad Commission.

The City of Dallas in 1917 also granted a franchise to the Dallas Electric Light and Power Company with rates of return corresponding closely to those in the railway franchise above described. Under this franchise rates have been reduced sufficiently to bring the 9 per cent rate of return into effect. There have been no

important developments in service-at-cost franchises subsequent to the above cases, which, it will be noted, show a progressive increase in rates of return.

It should be remembered that the returns provided in these franchises are more definitely assured because of the prompt and automatic adjustment of fares than under the more conventional methods of regulation. The rates of return under the latter conditions, which should be considered as permissive rather than assured, ought logically, therefore, to be appreciably higher.

AUTHORIZED RAILROAD RETURN

It may be contended that the return authorized to railroad companies in the United States by the Transportation Act of 1920[1] should be considered in determining a fair return to public utilities. The Transportation Act provided for a fair return equal to 5.5 per cent on the aggregate value of railroad property, but the Interstate Commerce Commission was authorized temporarily to increase this rate, and did so to the extent of one-half of 1 per cent for a period of two years, since which time the rate has been 5.75 per cent.

The average yield from railroad investments has always been substantially lower than that from public utility investments except under abnormal conditions, the difference in bond yield being ordinarily not less than 0.5 per cent. The railroad industry is much older than the public utility business and has had a much broader investment market with correspondingly greater activity in its securities. It is also true that the railroad industry has not been prosperous in recent years, before as well as since the passage of the Transportation Act, and for more than fifteen years railroad financing through junior securities has been impossible, with negligible exceptions, at any reasonable rates. During this period the total railroad mileage in the United States has shown a slight decrease instead of the increase which expanding activities would justify under favorable credit conditions. The railroad capital structure now contains an undesirably large proportion of indebtedness, and this is primarily responsible for many railroad receiverships in recent years. The railroads need restored credit and junior financing, which can only be

[1] Sec. 15*A*, Par. 3.

brought about through substantial increases in existing income. Clearly, public utilities should not be subjected to the embarrassment and lack of facilities for adequate service which the railroads have recently experienced. To avoid such conditions a substantially higher return than that provided for railroads by the Congress must be earned.

RETURN BASED ON INTEREST PLUS PROFIT

Still another method involving interest rates has sufficient merit to warrant passing attention. It is commonly understood that an industrial or mercantile enterprise should make profits of about 10 per cent on annual sales, in addition to bare interest upon the capital employed. If this method is applied to public utilities, with their comparatively high investment amounting in an assumed case to five times the annual gross, with a 6 per cent interest rate, it appears that the fair return would be 8 per cent: $6 + 10 \times \frac{1}{5}$. With a lower capital ratio the fair return would be moderately increased, and it would be affected directly by any change in the interest rate.

Application to Railless Transportation.—This method of determining fair return may have significance in one new field of public utility activity, namely, railless transportation. It is the experience of certain large bus companies that the capital required for vehicles alone amounts to only about one-half instead of about five times the annual revenues required for rail transportation. If such companies had no other investment and were limited to the conventional public utility rate of return, a fluctuation in revenues of not more than 5 per cent would wipe out the entire balance available for investors. Fluctuations in revenue materially greater than this amount are commonly to be expected.

If there is substituted a return based on a 6 per cent interest rate plus 10 per cent of annual revenues, the amount available for investors would be 26 per cent of the annual revenues, affording a fairly safe margin. Some of the regulatory commissions dealing extensively with bus service have been concerned over a method of determining fair return for such operations which avoided the objections above pointed out to the conventional rate of return. The alternative here suggested may be a helpful solution of the problem of adequate bus revenues.

The above formula would not work out wholly satisfactorily with bus companies having less profitable business or maintaining extensive terminals and garage facilities and having total investment equal to or perhaps exceeding the annual revenues, this being the more common experience. The inclusion of the depreciation factor in the formula will assist in making it more generally applicable, through the fact that depreciation on buildings and facilities is less than on motor vehicles. If this factor is included to the extent of 14 per cent of annual revenues, the formula covering interest, profit, and depreciation becomes 6 per cent of investment plus 24 per cent of annual revenues, which will take care of a wide range of railless service and also yield a reasonable return for rail systems. This formula is presented merely to show the consistency between an 8 per cent return from a railway investment and a much higher return from motor buses.

RETURN IN OTHER ENTERPRISES

It has been stated that public utilities must compete in the general money markets for their new capital and must pay returns sufficiently high to attract needed capital from other industries. This does not necessarily mean that the rate must be the same, for the factors of stability of return and safety of principal must be considered. The rate of return commonly earned in other business is, nevertheless, a matter which must be given careful attention in determining the public utility fair return.

National Banks.—Among the businesses fairly comparable with public utilities are national banks, which are under close regulation and supervision by the Federal government. The annual reports of the Comptroller of the Currency show the earnings of national banks of the United States as a whole and by districts. The report for 1913 shows that the average net earnings upon combined capital and surplus of all national banks for a period of forty-four years then ending was 8.65 per cent. More recent earnings have been substantially higher, the reports for the years 1920 and 1921 showing net of 19.48 and 16.28 per cent, respectively. These percentages apply not to capital alone but to capital plus accumulated surplus in a stable and essential public activity fairly comparable with public utility service.

Industries.—Not long ago the author made a study of the profits of a group of five representative but diversified industries

well known throughout the United States. These industries included the American Sugar Refining Company, the General Electric Company, the National Biscuit Company, Sears Roebuck and Company, and the United States Steel Corporation. For a period of ten years ending in 1919 the average net profits of this group of industries was 11.75 per cent on the market value of their stock, this market value being more than 25 per cent in excess of par value. The minimum profit for the group in any one year was 6.54 per cent, and the maximum, 17.90 per cent. Only one of these five companies had a large proportion of debt in its capitalization, and in this one case (Steel Corporation) it amounted to less than 50 per cent of the total.

In 1916 a prominent public accountant made a study of the yields upon invested capital in a very large group of industries regarding which he had complete information. The results of his studies show that out of 158 properties examined 117 earned at least 8 per cent; 97 earned at least 10 per cent; 86 at least 12 per cent; and so on up to 40 per cent, which was earned by 10 of the properties. The operations examined were embraced in the years 1912 to 1914.[1]

In certain rate cases with which the author was associated in 1920 a number of prominent and successful business men were called upon to testify as to the general profitableness of business in the southeastern section of the United States. It was the consensus of opinion of these men that net profits upon the equities in successful business should average not far from 25 per cent, the various estimates ranging from 10 or 15 per cent up to a maximum of 50 per cent.

Public Utility Return Lower.—All the above figures of earnings of business enterprises differ materially and even radically from the percentages commonly authorized by commissions for public utility operations. The difference is due in part to the relative stability of public utilities and to their freedom in many cases from either actual or potential competition. It is not clear, however, that the existing differences are fully accounted for by the above or other pertinent reasons. It has been the experience of many public utilities that their profits have not been sufficient to permit free financing with junior securities which are essential to a balanced financial structure.

[1] STERRETT, J. E., "The Comparative Yield on Trade and Public Service Investment," *Amer. Econ. Rev.*, March, 1916.

LIBERAL RETURN FOR WHOLESALE UTILITIES

It may be appropriate in this connection to suggest a distinction in return allowed to public utilities, particularly electric and gas companies, having a large proportion of wholesale business. It has been seen that industrial business is subject to wide fluctuations, earning very high returns in prosperous years and comparatively little during business depression. It would be wholly logical for public utilities serving customers of this character to embody in their rate schedules provision for liberal returns during periods of high consumption in order to equalize the deficiencies when consumption is comparatively small. Such provision is made in the demand form of rates, discussed in another chapter, but rate schedules will not provide the required protection unless the authorized return is correspondingly flexible. Without this flexibility the more stable retail business will be called upon in times of depression to bear a part of the cost of supplying wholesale service, which is obviously inequitable. Close competition in the wholesale field may make the suggested liberal return impossible of realization, but when, through hydroelectric service or otherwise, it is obtainable, it should be authorized.

DEBT AS A MEANS OF REDUCING FAIR RETURN

In connection with the figures first presented of the requirements for return, including interest and preferred and common dividends, it appeared that a capitalization made up of about two-thirds debt and one-third equity might show a lower total cost of money than if the debt were substantially greater or less. Certain engineering and economic writers, assuming the correctness of this statement, have contended that utilities under regulation were bound to furnish service at the lowest possible cost, including the fair return element, and that they should, therefore, borrow a substantial part of their capital. On the other hand, executives of public utilities, without debt and paying liberal dividends, stoutly maintain that they are under no ethical or other obligation to saddle their properties with an unnecessary debt in order to reduce the cost of service. They furthermore deny that any material reduction in cost of money and of service would result from such indebtedness. Here is an interesting problem in regulation which awaits authoritative

solution. It has not yet been given serious consideration by the commissions.

ALLOWANCES IN RATE CASES

It is now in order to consider more specifically the rates of return authorized by courts and commissions in cases involving rates. The history of commission decisions shows authorized rates of return normally lying between 6 and 9 per cent, with some higher rates during the post-war period upon all or new capital. The general tendency of the allowances has been upward, until at the present time the standard authorized rate is 8 per cent. Such characterization of 8 per cent appears fully justified in view of the small percentage of cases in which the normal fair return has been fixed at lower points during the last few years. Some of the lower returns so fixed were influenced by inefficient management or other local or special conditions and others were subsequently enjoined by the courts.

Court Decisions.—The history of court procedure involving rates of return differs somewhat from that above outlined for the commissions. For many years the Federal courts definitely used no rates higher than 6 per cent upon the fair value of the property. In the *Consolidated Gas* case, decided in 1909, the court, in fixing 6 per cent as a non-confiscatory return, called attention to the fact that the property involved was exceptionally stable, in the following language:

> In an investment in a gas company, such as complainants', the risk is reduced almost to a minimum. It is a corporation, which in fact, as the court below remarks, monopolizes the gas service of the largest city in America, and is secure against competition under the circumstances in which it is placed, because it is a proposition almost unthinkable that the city of New York, would, for purposes of making competition, permit the streets of the city to be again torn up in order to allow the mains of another company to be laid all through them to supply gas which the present company can adequately supply. And, so far as it is given us to look into the future, it seems as certain as anything of such a nature can be, that the demand for gas will increase, and, at the reduced price, increase to a considerable extent. An interest in such a business is as near a safe and secure investment as can be imagined with regard to any private manufacturing business, although it is recognized at the same time that there is a possible element of risk, even in such a business.[1]

Confiscation.—In the early Federal cases the opinion seemed to prevail that there was a difference between a rate of return

[1] 212 U.S. 19, 48.

which was fair and one which was confiscatory, that the commissions were charged with the duty of establishing fair rates, but that the courts were concerned only with such lower rates as clearly deprived the owners of the property of their constitutional rights. The inconsistency of this early distinction is clearly pointed out in a California case as follows:

Some writers have spoken of a "twilight zone of injustice," in which the legislative body may roam at will in fixing rates, and while acting in this unilluminated region the courts are powerless to control its judgment. That is, as intimated in the majority opinion, that the council may adopt a rate which the court would not, if sitting as a legislative body, regard as reasonable, and yet, sitting as a court, it cannot say is unreasonable. If there is a warrant in reason for such a doctrine, the court should at least place some sort of limit to the field in which the rate-making body may exercise an uncontrolled discretion. It is within the proper and rightful exercise of its functions for the court to say to the legislative body that any rate which fails to measure up to what the court may declare to be reasonable compensation would be void as unreasonable, and, in my judgment, it is competent for the court, in view of all the circumstances, to say what this minimum should be, having reference to the nature and character of the service to be rendered.[1]

The more modern view of the courts on this question holds that any rate of return which is unreasonable is also confiscatory but that, before enjoining a rate of return fixed by a commission, the courts should carefully weigh all the evidence upon which the commission's decision was based, giving the commission the benefit of every reasonable doubt involved therein. The commission may have fixed too high a value or have made too liberal allowances for expenses, taxes, retirements, etc., so that an apparently low rate of return which the commission applied to the designated rate base might, through correction of possible errors, turn out to be a fair return upon the correct present value. What the court, therefore, does is to make allowances, not for differences between fair and confiscatory rates of return, but for possible errors in arriving at the final resulting income to which the property is entitled. That this is the present attitude of the higher courts will appear from the following quotations from recent decisions:

Under the former rule that a rate-fixing ordinance, in the absence of fraud, was conclusively presumed to be just and reasonable, it was possible, under the guise of regulation, to reduce the earnings of the property devoted to public service to the vanishing point, and thus set at naught the constitu-

[1] *Contra Costa Water Co. vs. Oakland*, 159 Cal. 323.

tional guaranty against taking property for public use without just compensation. The present rule gives to every person owning such property who is aggrieved by such an ordinance his day in court; neither his plant, nor any portion of its just and reasonable earnings, can be taken without due process of law. (*Re Spring Valley Water Co.*, 165 Fed. 667, 680.)

It is well settled, where a rate fixed by the legislature, or a subordinate body to whom the power has been delegated, does not furnish a fair return upon the reasonable value of the property at the time it is being devoted to the public use, that such act is so confiscatory in its effect as to violate the Constitution of the United States. (*Re Bronx Gas & Elec. Co.*, N.Y. Sup. Ct., P.U.R. 1920 C, 788, 795; 180 N. Y. Supp. 38.)

Rates which are not sufficient to yield a reasonable return on the value of the property used at the time it is being used to render the service are unjust, unreasonable and confiscatory, and their enforcement deprives the public utility company of its property in violation of the Fourteenth Amendment. This is so well settled by numerous decisions of this court that citation of the cases is scarcely necessary. (*Re Bluefield Waterworks & Improvement Co.*, 262 U.S. 679; P.U.R. 1923 D, 11, 18.)

For further citations and extended discussion see P.U.R. 1918 B, 28–47.

Authorizations of 8 Per Cent or More.—The prevailing opinions of courts and commissions above referred to, in which a return of at least 8 per cent has been approved, are illustrated by the following quotations:

COURTS

Moreover, no rate of return can be deemed reasonable, which is not high enough to attract capital to the form of investment involved in utility properties and a return of 8 per cent upon the fair value of such utility properties has been held to be reasonable. (*Louisiana Water Co. vs. Missouri Public Service Commission*, P.U.R. 1924 C, 293, 299; 294 Fed. 954.)

The allowance of an 8 per cent return has commonly been used as a basis by the State and Federal Courts, and by the Commission, for several years past, and I shall submit my findings upon that basis. (*Re Bronx Gas & Electric Co.* (N. Y. Sup. Ct.), P.U.R. 1923 A, 255, 283.)

It has been held that no rate of return can be deemed reasonable which is not high enough to attract capital to the form of investment involved in utility properties, such as complainant's. Lincoln Gas & E. L. Co. v. Lincoln, 250 U.S. 256, 39 Sup. Ct. Rep. 454, 63 L. ed. 968. A return of 8 per cent upon the fair value has been held to be reasonable. (*Re Alton Water Co.*, P.U.R. 1922 E, 623, 628; 279 Fed. 869.)

If a Commission rate allowed a return of 8 per cent upon the property employed, that order is not unreasonable, is lawful, and should not be set aside. Any rate of return appreciably less than that, in my judgment, would be unreasonably low in the present state of the money market, and

should not stand. On the other hand, an existing rate which allowed a return of approximately 9 per cent would be, in my judgment, reasonable, and should not be set aside because it is unreasonably high. (*Re Southwestern Bell Telephone Co.* (Kan. Sup. Ct), P.U.R. 1924 D, 388, 469.)

COMMISSIONS

This Commission is of the opinion, after mature consideration, that a return on the fair value of the property and capital employed by applicant of 8 per cent is reasonable and really needed to enable it to render to the public, under existing conditions, efficient and adequate service. (*Re Georgia Railway & Power Co.* (Ga.), P.U.R. 1921 A, 165, 178.)

The Commission has heretofore, in this matter, established a rate of return of 8 per centum annually on the fair value of the property of this utility. (*Re Lansing Fuel & Gas Co.* (Mich.), P.U.R. 1923 C, 348, 353.)

We further find that an annual return of 8 per cent of the value of the company's property, used and useful for the convenience of the public in the furnishing of the service involved, is just and reasonable, and not greater than the company is entitled to earn upon such investment. (*Re Northwestern Ohio Light Co.* (Ohio), P.U.R. 1924 B, 762, 765.)

The present gas rate is showing about 9 per cent net return, which is ample but not excessive, especially when it is remembered that the operating expenses for the last few months have been below normal because of low repair charges due to the use of brand new water gas equipment. (*Re Lynchburg Traction & Light Co.* (Va.), P.U.R. 1922 B, 737, 740.)

Taking into consideration the risk incident to the business and the high interest rate that the defendant company pays for a great deal of its money and further taking into consideration the fact that the cost of financing is borne by the consumers and that the Federal income tax is included in the operating expense, we are of opinion that 8 per cent is a fair rate of return to the investors. (*Re Appalachian Power Co.* (W. Va.), P.U.R. 1923 E, 221, 230.)

INCENTIVES UNDER REGULATION

It has been pointed out in previous chapters that there is a tendency in regulatory practice and also in the conventional service-at-cost franchises to remove from public utility operations that incentive for continued improvement in service and efficiency which unregulated enterprises offer. It is obvious that if the owners of a property are assured of a certain fixed return from their investment and no more, there is no direct incentive for them to make special efforts to reduce the cost of service, to make extensions, and otherwise to secure increases in income—all of which would be taken away from them through reduced rates.

The public utility industry has experienced its unparalleled development through the efforts of leaders of aggressiveness and vision who have seen possibilities of vast expansion and of large profits. Many of these men have also been interested in other kinds of enterprises. If or when such men realize that their efforts in the public utility field will bring them no reward corresponding to that obtainable in other fields, their interest in public utility activities will disappear and their energies will be transferred to other fields. The result would be stagnation in the industry, and only such progress and development as was forced upon it by public pressure, such pressure in time being exerted only upon such executives of moderate capacity as had not deserted the industry for other more promising and profitable activities.

The depressing results of regulation, above pictured, are not yet in evidence because of the momentum created in earlier years, the faith of many leaders that rewards for their activities will not be wholly denied them, and the further possibilities that between intermittent adjustments of rates there may be opportunities of profit outside the fixed conventional limits.

Views of Commissions.—Some of the commissions and others who have given this situation serious thought have not been unmindful of its gravity. This is illustrated by the following extracts from commission and other opinions:

If a public utility can by efficient management reduce the operating expenses below the ordinary amount, or if it can by the application of a broad and public spirited policy develop a community and thereby develop its business and increase its earnings, it is certainly entitled to share in the increased earnings directly resulting therefrom. We believe that the application of this policy will create an incentive to greater and more efficient effort on the part of the investor, and that it will rebound to the benefit of the community served as well as of the entire state. (*Re Sandpoint Water & Light Co.* (Idaho), P.U.R. 1915 F, 445, 466.)

It is true that public utility companies in a growing community constantly require new money, and that, under the system of private ownership, conditions must be made attractive enough so that private capital will freely enter the field. It is also true that it would be gross folly for the commonwealth to furnish investors reasons for fearing that they are likely to be prevented, by any action of public authorities, from securing a return commensurate with the risk upon investments honestly and prudently made in public utility enterprises which are reasonably well managed, or an even larger return where the the management is more than ordinarily efficient. (*Re Bay State Street Railway Co.* (Mass.), P.U.R. 1916 F, 221, 285.)

It is not fair, however that *all* savings effected by efficiency of operation and management (in contrast to those savings which may result from economic and other conditions which may be extraneous to the utility's management and operation) should accrue to the consumers alone. Were such to be the outlook, the future would hold little incentive to the utilities to increase their efficiency of operation and management. Instead, there would exist every incentive for inefficiency. The public, from time to time, is demanding improved utility service, and more of it; and for first-class service the public is invariably willing to pay adequate and remunerative rates. Between these two extremes, *viz.*, the utility taking all future savings, or the public taking all the savings, there appears to be a happy middle course which takes cognizance of both points of view. Should the utility be able to show marked savings due directly to efficiency of operation and management, it is entitled, upon a readjustment of rates, to an increase in the rate of return fixed in the initial rate investigation, provided the said utility exhibits a willingness to share its savings with its consumers by making future rate reductions from time to time. (*Re Lincoln Water & Light Co.* (Ill.), P.U.R. 1917 B, 1, 134.)

We believe, and it is our judgment, that honest, economical and efficient administration of the affairs of a public utility should be commended by us, and should be considered in deciding the amount of a fair rate of return upon the company's property, since to hold otherwise would be but to penalize economical, efficient and honest management, and encourage extravagance and lax methods in the management thereof. *Re Lima Telephone & Telegraph Co.* (Ohio), P.U.R. 1922 A, 155, 157.)

The amount of this return should be governed to some extent by the character of the management. A company that is on the alert to practice economies should have some part of the saving, else there would be no inducement to reduce the cost of the service. (*Re Duluth Street Railway Co.* (Wis. Sup. Ct.), 152 N.W. 887; P.U.R. 1915 D, 192, 206.)

When a public utility conducts its affairs in an extravagant and unwise manner, we do not feel called upon to establish for it rates that will give it ample return despite this mismanagement. In other words, there should be a penalty paid for mismanagement; and, conversely, there should be some reward for good and economical management. If this were not so, there would be no inducement for a public utility to conduct its business in a careful and economical manner; but, since it is the duty of a utility to be economical and careful in the conduct of its business, the fruits of good management should not go alone to the utility, but the patrons should have their share also. (*Re Montesano Telephone Co.* (Wash.), P.U.R. 1925 A, 676, 679.)

The amount of return should be such as to provide for the cost of economical and efficient operation, taxes, depreciation, a fair net return on the fair value of the property devoted to public use, and a proper margin for the successful conduct of the business. Exceptional efficiency of managment should receive consideration and encouragement. Report of Public Utility Rate Committee, *Proc. Nat. Assn. Ry. and Utilities Commissrs.* 1917, p. 448.

Higher Returns for Efficiency.—It appears from the above quotations that the commissions are of the opinion that efficiency and progressiveness should be rewarded by a higher rate of return. Several commissions are so thoroughly convinced of the correctness of this view that they have undertaken to grade public utilities through an elaborate system of ratings involving efficiency in operations, continuity of service, business development, public relations, and many other pertinent factors, the intention of these commissions being to be more liberal in rate cases with utilities of high grade than with others that have shown less progressiveness.

The application of such a system has its limitations, due to the impossibility of accurately gauging the fundamental merits of utility operations by any arithmetical system of marks. Such limitations, however, do not affect the merits of the general plan. A recent writer[1] has suggested an alternative arrangement under which the reward for meritorious operation would go to the managements of the utilities rather than their owners, on the theory that the owners are not directly concerned in management problems so long as the return on their investment is satisfactory, and that rewards to management would be more effective than similar recognition of owners. Although there may be some merit in this suggestion, it is not believed that the owners of public utility properties are as indifferent as is assumed to the successful operation of their properties or that they can be excluded from responsibility or reward for successful operations. The owners elect directors who in turn select officers and agents who will faithfully protect the owners' interests.

A wholly effective method of stimulating continued enthusiasm and progressiveness may not yet have been discovered, but it is clearly apparent that some incentive is necessary if regulated public utility operations are to continue to develop and improve as they have done in the past.

RELATIVE WEIGHTS OF VARIOUS MEASURES OF RETURN

The foregoing discussion has outlined various methods of determining fair return, none of which is wholly satisfactory. The return which investors receive from properties financed wholly through capital stock furnishes a good indication when

[1] MORGAN, C. S., "Regulation and Management of Public Utilities." (See author's review of this book, *Stone and Webster Journal*, May, 1924, p. 567.)

extra dividends, supplementary return through rights, and other pertinent factors are all given due weight. The rates of return embodied in recent service-at-cost franchises, in which neither party had a strategic advantage in the negotiations, also furnish a very good index to the prevailing and anticipated rate of return.

It is obvious that a return bearing a fixed relation to interest rates would have yielded much higher percentages during the war than the returns authorized by the commissions in any rate cases. The cost of borrowed money during and following the war rose to more than 8 per cent, making a fair return rate, assumed to be 50 per cent higher than the interest rate, between 12 and 15 per cent. It has been seen that the maximum allowance during this period was in the vicinity of 10 per cent. Although it is probable that the fair return rate is not directly related to interest rates, it is also true that there has not been sufficient flexibility in the rates authorized by commissions adequately to take care of emergency conditions.

COMMISSIONS CANNOT FIX COST OF MONEY

In conclusion, it should be emphatically pointed out that regulatory commissions cannot fix the rate of return which public utility properties should earn. Such rates are fixed by investors whose money is available for those capital purposes which make the most attractive offers. If regulation rejects or is ignorant of the requirements of investors, and fixes return so low that capital is not freely attracted, the first result will be that utilities must resort to that class of securities involving the lowest yield, namely, bonds or notes, because the earnings of the properties will not be sufficient to attract junior security investors. The ultimate result of this program would be a wholly excessive proportion of debt, with the attendant risk of receivership under unfavorable business conditions. It has been noted that a high percentage of indebtedness in the capital structure results in an increase in average cost of money, which, in turn, will require higher rates for service.

RESPONSIBILITIES OF COMMISSIONS

Regulatory commissions are charged with a particularly grave responsibility in interpreting financial conditions and fixing rates of return which, in their judgment, will attract capital to

the industries under their supervision. If these responsibilities are not fully met, the utilities involved will suffer loss of credit and will fail in their duty to render adequate public service.

Most communities are proud of the prosperity of the industries in their midst. They boast of the success and soundness of their banks and of the enterprise and progressiveness of their mercantile and industrial establishments—all the result of liberal earnings. Such communities should be equally proud of the prosperity of their public utilities. In fact, they should be more solicitous for such prosperity because it more vitally affects their own interests than any other local business activity.

> Our social system rests largely upon the sanctity of private property, and that State or community which seeks to invade it will soon discover the error in the disaster which follows. The slight gain to the consumer, which he would obtain from a reduction in the rates charged by public service corporations, is as nothing compared with his share in the ruin which would be brought about by denying to private property its just reward, thus unsettling values and destroying confidence. (*Re Knoxville Water Co.*, 212 U.S. 1, 18.)

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CHAPTER X

RATE STRUCTURES

If all units of product or service furnished by public utilities were alike, or substantially so, the problem of rates would be simple. It would only be necessary to divide the total revenue needed to cover the cost of service by the total units sold to determine the uniform rate to be charged for all units. Such uniformity, however, does not exist in the units which public utilities sell. They differ widely not only with respect to the quantity sold per customer but also with respect to the regularity or continuity, time, and other pertinent circumstances of the sale. These differences cause a wide variation in the cost per unit and corresponding variations in the selling price. In order to take care of these variations, more or less complicated rate schedules are necessary and the service rendered is commonly divided into classes, and different rate schedules applied to the different classes.

RATES TO YIELD COST OF SERVICE

Although the purpose of such classification and rate schedules is to adjust the revenues which the rates produce to the cost of service, it is never possible wholly to accomplish this result. In spite of classification and refinement, the individual characteristics of customers and the necessary limitations upon classifications make it impossible always to fit rates to costs. Nor is it always desirable fully to carry out such adjustment because value of service as contrasted with cost of service is a factor which in practice is not ignored, although not generally controlling.

Limitations.—Other factors than either cost or value of service play an important part in the make-up of rate structures. Expediency, public relations and political conditions, the character of the customers, and other similar factors have a bearing, particularly upon retail rates. It is generally recognized that maximum rates should not exceed a certain conventional limit, which, for electric service, may be assumed to be not far from

10 cents per kilowatt-hour for companies with fairly large and well-developed business. The cost of the service rendered to many small or infrequent users of service may be much in excess of this limit, but, for the reasons outlined above, this limit is fixed and the losses from higher-cost service are recovered from other more profitable customers, presumably those where the value of service exceeds its cost by the maximum amount. It is not clear that such procedure is of real advantage to the unprofitable customers because the stores and other establishments that make up their losses include them all in the prices they charge for shoes, eggs, and other commodities which the unprofitable utility customers purchase.

Increment Costs.—Retail service is not the only class in which rates do not always cover the full normal cost. Many electric utilities have in their territory large industries whose power business can be secured only at rates lower than existing normal costs of rendering service, but still in excess of what are known as increment costs. Increment costs may be defined as those elements of cost which are specifically and necessarily added to those applying to business already existing in order to handle an increased output so that with added revenues equal to such costs the total profit from existing and new business combined will be equal to that previously earned. Increment costs are often incorrectly figured by overlooking certain necessary increases in distribution and administrative costs and fixed charges. When increment costs are correctly computed, rates based thereon, when higher rates will not secure the business, involve no injustice to existing customers. If, as is usually the case, the rates are fixed somewhat higher than bare increment costs, then, to the extent of the excess, the business as a whole benefits by the application of such rates. It is not contended that wholesale rates should be based upon increment costs as a regular practice but that as a last resort such rates do not work to the disadvantage of other business but may be of distinct advantage through higher efficiency of all service.

Inequalities in rates are most pronounced in the fare schedules of urban electric railways where, in general, a uniform charge is made for a ride of any distance within the limits of a given transportation system. This practice of uniform fares is encouraged by the absence of protests from short-distance riders who, in fact, help to pay the cost of long-distance rides. Up to the

present time inequities in the gas business are comparatively small because of the more uniform character of this business. This chapter, therefore, while discussing the characteristics of existing gas rates and fare schedules, will devote particular attention to the greater complications existing in electric rates, and the necessities for such complications if a maximum profitable development of business is to be secured.

AIM IN RATE SCHEDULES

The ultimate aim of those who embark in any productive enterprise is the maximum possible increase in their personal fortunes. Contrary to the common views of economic writers, this aim is not ordinarily attained through a business policy which develops maximum revenues or maximum income or even maximum present revenue or income per dollar of investment. The wise investor will look also to the future value of his equity which may be increased more by a program of present sacrifice for the sake of future expansion than by maximum current profits.

Such a program may not be applicable to certain forms of monopoly which are restricted in their market possibilities, but it is particularly appropriate in the utility field where the opportunities for growth are exceptionally large. The common rule of increase in market through reductions in prices is well illustrated in the history of electric and gas utilities. They have found that rate reductions have resulted in increased volume and stability of business and improved public relations, which have repaid the necessary initial sacrifice. To an unusual degree, therefore, the enlightened self-interest of such utilities is in full accord with the public interest and the views of progressive regulatory commissions in bringing about a maximum development of service without, however, excessive present curtailment of return or impairment of credit.

The application of the foregoing principles to the specific design of rate structures requires both experience and sound judgment. There is always the alternative of adhering to conservative rates which yield a fair return on existing business or of developing incentive features in new rates which will bring about an enlarged volume of business and may yield larger future income. Neither extreme conservatism nor similar

optimism should prevail, but an intermediate course in which the regulatory commissions may well serve in an advisory capacity.

ELECTRIC RATES

Turning now to the specific rate problems of electric companies, it may be found helpful to review briefly the history of electric rates and the reasons for the various changes which have been made, thereby developing the principles underlying existing rate structures. In the earliest days of central stations only a very few lamp sizes were available and lighting service was furnished at a flat rate per lamp per month without restrictions upon the hours of use, although in due time lamps which were not used after midnight were given lower rates than those burning all night. The inequity of this form of rate was soon apparent, for it made no allowances for quite wide ranges in use within the permissible limits, or for the increasing number of lamp sizes and types which began to appear. Therefore, substitute rates, which fully recognized both hours of use and size of lamps, came into effect, and in due time the watt-hour meter was developed to determine directly the actual amount of energy consumed through any number or use of lamps. This energy was all charged for at a uniform rate per kilowatt-hour.

Quantity Differentials.—Even this more equitable rate was found to be objectionable in that its uniformity was inconsistent with the ordinary commercial practice of charging lower rates for large quantities of commodities than for small quantities. In recognition of this practice the uniform electric rate per kilowatt-hour was made subject to a series of discounts for increasing quantities purchased, these discounts varying from 5 or 10 up to 50 per cent or more. It was not unusual to make the allowance of these discounts contingent on prompt payment of bills, although the absurdity of a 50 per cent discount for payment within ten days instead of thirty days was obvious.

Step Rates.—To avoid this inconsistency there was next developed the "step" form of rate, under which, for example, the maximum rate applied if the consumption was less than 100 kilowatt-hours per month, a somewhat lower rate applying to the entire consumption if it was between 100 and 500 kilowatt-hours, and a still lower rate for still larger consumption, etc. The step rate does not differ essentially from the preceding form and,

aside from prompt-payment discount limitations, may yield identical results.

Objections to this form of rate developed in due time from both customers and regulatory commissions. Customers pointed out that under certain circumstances they might pay more for a certain number of kilowatt-hours than for a somewhat greater number. For example, a customer using 95 kilowatt-hours under a 10-cent rate would pay $9.50, whereas another customer using 100 kilowatt-hours to which a 9-cent rate applied would pay only $9. To avoid this inconsistency, it is customary to draw back the upper limits of consumption in the several steps so that the cost at the upper limit in each step will not exceed the cost at the lower limit of the next step. Consumption anywhere between step limits so adjusted is billed at a uniform amount equal to the common charge at the two limits. This means a partial reversion to the old flat-rate scheme, the extent of the reversion depending upon the number of steps and the spread of the corresponding rates. A number of state commissions have also pointed out that this form of rate-schedule, even when adjusted as just indicated, was discriminatory in that different customers paid different rates for their entire consumption if the quantities were substantially different, or they might pay the same amount for materially different consumptions.

Block Rates.—These difficulties and the resulting commission disapproval of step rates led to the introduction of the so-called "block" form of rate, under which all customers pay the same rate for their service within the limits of their several requirements. This form of rate, together with the step and other forms, is illustrated on the following pages.

It will be seen that this form of schedule meets the objection of the commissions to the step rate in that two customers, one purchasing 25 and the other 1,000 kilowatt-hours per month, will each pay 10 cents for 25 kilowatt-hours. Superficially, this form of schedule appears more complicated than the step form, with greater difficulties in rendering and checking bills. As a matter of fact, these difficulties are obviated so far as billing is concerned by billing tables and other time-saving devices which make billing computations quite simple.

Load-factor Differentials.—Even the block form of rate failed to meet the requirements of certain service characteristics

which cannot be ignored, at least for large customers. The particular characteristic in question is load factor, which may be defined as the ratio between average and maximum load or between the actual kilowatt-hours in a given period and the possible kilowatt-hours with the maximum load continued throughout the period. As an illustration, two customers may be considered, each having a monthly consumption of 1,000 kilowatt-hours. In one case this is developed from a load of 10 kilowatts used during 100 hours; in the other case it is developed from a load of 100 kilowatts used only 10 hours. Clearly, the costs of service in the two cases are not the same, for in one case an investment is required to handle ten times the maximum load of the other case with corresponding increase in fixed charges which are an important part of the cost. Obviously, that part of the cost of service depending upon the amount of investment required is independent of the time during which the use continues. On the other hand, certain other elements of costs are directly proportional to the extent of use or the kilowatt-hours.

Wright Demand Rate.—The first form of rate which recognized load-factor conditions was the so-called Wright demand rate, developed in England in 1896,[1] in which the demand costs were included in an initial high rate per kilowatt-hour, applicable to a certain number of hours of use of a customer's load, all excess kilowatt-hours being at a lower rate. This form of rate may be illustrated by the following schedule:

First 50 hours' use per month of the demand, 10 cents per kilowatt-hour.

All excess consumption, 6 cents per kilowatt-hour.

If 6 cents per kilowatt-hour is a reasonable charge for operating expenses, obviously the above rate, in which 4 cents additional are charged for each 50 kilowatt-hours per month per kilowatt of demand, is equivalent to a distinct demand charge of $2 per month. This form of rate may be extended and made more flexible by adding lower-rate energy blocks or by further intermediate blocks depending upon demand, or both.

Even this form of rate does not wholly provide for all service contingencies. If a customer fails at any time to make any use of the facilities which have been assigned to him, he makes no payment unless some arbitrary minimum is fixed, although the

[1] Wright, Arthur, "Cost of Electricity Supply," Municipal Electrical Assn., England.

fixed charges on the facilities which he ordinarily uses continue. If his use is small although not zero, his rate, nevertheless, never rises above the maximum named in the schedule. In other words, under the Wright demand rate the utility is not fully protected against loss from non-use of service.

Hopkinson Rate.—To provide for the above contingency the so-called Hopkinson demand rate or ready-to-serve rate was developed and has come into very general use for wholesale service.[1] This form of rate undertakes to avoid any ambiguity as to the character and purpose of the charges made for service, setting up two independent forms of charges, one to cover such costs as are independent of use, called demand charges, the other covering costs varying directly with use, called energy charges. The demand charges, expressed in dollars per kilowatt of demand, are paid regardless of the amount of energy taken or whether or not any is taken. The justice of this is obvious when it is considered that facilities which the customer uses are always at his command and cannot be assigned to another customer so long as this customer may need them. If the customer had his own plant which was idle because of lack of business, his fixed charges would go on just the same as if it were active, and so the uniform payment of demand charges involves no hardship. The energy charge needs no further explanation. It is obvious that the resultant rate per kilowatt-hour under such a schedule may vary through extremely wide limits without any such maximum limit as the Wright demand rate provides.

Method of Computing Demand Charges.—As has been stated, the demand charge is intended to cover costs independent of the use of service, such as interest and dividends on investment, depreciation, taxes, and insurance. If the investment necessary to serve a particular customer is $300 per kilowatt of power-station capacity and it is necessary to have 25 per cent reserve capacity to protect the customer from service interruptions, then the investment per kilowatt of customer's demand, neglecting line losses and diversity between customer demands, will be $375 per kilowatt, and line losses will increase this amount to not less than $400.

Diversity will reduce the amount to an extent depending upon the characteristics of the customer's load. If this load is continuous, there will be little opportunity for other customers also

[1] Hopkinson, Dr. John, "On the Cost of Electric Supply," 1892.

to use at certain times the capacity which is assigned to the customer in question. With low load factor and intermittent use this diversity may assume considerable proportions, and for present purposes it will be assumed that the total investment per kilowatt of customer's demand is $300. The fixed charges on this investment, including the items above listed, would amount to from $40 to $45 per annum, or something like $3.50 per kilowatt per month. A Hopkinson rate might, therefore, take the form of $3.50 per kilowatt of demand per month plus 5 cents per kilowatt-hour. A rate such as that named might be suitable for small businesses but would not attract large industrial prospects. The investment per kilowatt to reach large customers is, of course, less because of the lower cost of transformers, meters, and pole lines, and large power service makes it possible to purchase larger generating units at lower unit cost. The cost per kilowatt-hour of delivering energy also decreases materially with the quantity involved. It is, therefore, practicable to design a demand rate which will apply to power business of any size by suitable "blocking" of the demand and energy charges. Such a rate might then take the following general form:

Demand Charge

	Per Month
First 10 kilowatts or less of demand	$35.00
Next 40 kilowatts of demand	3.00 per kilowatt
Next 200 kilowatts of demand	2.50 per kilowatt
Next 750 kilowatts of demand	2.00 per kilowatt
Over 1,000 kilowatt of demand	1.50 per kilowatt

Energy Charge

	Cents
First 1,000 kilowatt-hours per month	5
Next 4,000 kilowatt-hours per month	3
Next 45,000 kilowatt-hours per month	2
Next 450,000 kilowatt-hours per month	1
Over 500,000 kilowatt-hours per month	0.8

The minimum demand charge is provided to cover the cost and upkeep of the necessary demand meters which would not be justified for very small installations without some supplementary charge. This minimum charge also serves to divert small business automatically to other simpler rate schedules. Many of the large power contracts are now being written under schedules of the above form.

Restricted Service Rates.—One further factor affecting power costs occasionally arises and requires attention. It involves business of a so-called seasonal or off-peak character. A typical example is that of refrigerating plants which have their maximum activity in the summer when lighting service is at a minimum, and their smallest loads in the winter when electric plants usually have their annual peaks. Various other classes of business, including pumping, battery charging etc., although possibly uniform throughout the year, can be curtailed during any specified hours of the day. All such business may utilize capacity already installed for other regular customers, therefore involving no additional investment for generating capacity and possibly only partial investment for transmission and distribution lines, etc.

Because of the curtailed investment required for such business, it is customary to apply lower rates, the reduction logically affecting the demand charge. Such reduction ordinarily amounts to 40 to 50 per cent of the total demand charge, depending upon whether or not the customer wishes to reserve the right to carry on some limited power operations without restriction.

A word of caution with reference to the use of off-peak or limited-hour rates may be appropriate. In earlier years when lighting made up the greater part of electric sales, it fixed the maximum loads and, therefore, the investment in station capacity. With the constantly increasing proportion of power business there is now a pronounced tendency for maximum loads to occur at other than winter lighting hours. Such peaks frequently occur in other than winter months and in forenoon hours rather than evening. It is, therefore, becoming impossible for an electric company with a comparatively large power business to define specific hours during which it has the right to discontinue restricted service. An industrial power customer can curtail his operations during late afternoon hours in winter but cannot subject himself to a program involving power supply interruption at any season of the year or hour of the day unless other sources of power are available and advance notice of suspension can be given.

In spite of shifting and uncertain maximum load periods, it is, nevertheless, true that electric companies normally have a substantial margin of unused capacity provided for breakdown or emergency service. In fact, it is considered good practice to have sufficient total capacity so that the largest unit may be

out of commission without any curtailment of unrestricted service. This reserve capacity is used comparatively little, and if customers can be found who are satisfied with such service as it can render, this service can be sold at comparatively low rates. It should, however, be called "unrelayed" service rather than off-peak, and it is to be expected that service of the latter class will tend to disappear in the near future, at least in systems serving large industrial customers.

Diversity.—Reference has been made above to diversity, which may be defined as the ratio of the total of the maximum demands of individual customers occurring at any time during a given period to the maximum station load resulting from such service at any time during the same period. It is obvious that the maximum loads of different customers will occur at different times, which means that the sum of their maxima will be greater than the actual station load at any time. The effect of this diversity in designing suitable rates is of considerable importance, but, unfortunately, accurate data regarding it are very limited. Extensive tests have been made on small low load-factor business, showing diversity as high as 10 between customers and the power station. Other tests of high load-factor power business showed very little diversity, that of a group of textile mills which the author recently determined being only 1.05. There is great need of further and more general data on this subject, but the cost of extensive investigations is necessarily large. In a general way it may be stated that diversity ordinarily decreases as load factor increases.

Because of the wide range in diversity which exists in power and other industrial service for which no existing rate structures —even the complicated forms of the Hopkinson rate and its modifications which have been illustrated above—make adjustment, there may be substantial differences between costs and revenues in specific cases. These differences can be corrected in part under certain assumed circumstances, but efforts in this direction are necessarily approximations. It has just been stated that high load factor implies low diversity. To a less extent it appears that large installations have lower diversity than small ones, because more consistent efforts are usually made to keep large investments continuously productive. Two adjustments for diversity, therefore, suggest themselves. The first involves demand charges and requires higher unit charges

for large demands than would be appropriate with more uniform diversity. In practice, this means that the block demand charges are not reduced as much as the reduced unit investments above referred to would imply. The second, and less definite, adjustment consists in keeping the rates in the lower energy blocks at a somewhat higher level than would be appropriate with uniform diversity because high energy consumption within limits implies high load factor, which, in turn, involves low diversity. These higher energy rates thus tend to offset the inadequacy in demand charges which low diversity occasions.

Retail Demand Rates.—Before leaving the subject of demand rates certain special forms should have brief mention. The Hopkinson rate, last described, is used primarily for wholesale business because of the wide variations and competitive character of such business. Retail business ordinarily does not have such varying characteristics and can be served through simpler rates. In recent years, however, residence service has become so diversified that the conventional form of rates has been found unsatisfactory and special class rates or demand rates have been found necessary. Residence service now includes not only lighting and small appliance service but also cooking, refrigeration, and house-heating auxiliaries, the consumption for lighting purposes frequently being an insignificant part of the total. For such diversified service the demand form of rate has been applied, using an arbitrarily determined rather than measured demand. On the assumption that the demand is related to the size of the house, the demand charge or the kilowatt-hours billed at a high rate are sometimes determined by the number of rooms or the floor area of the house. This is a crude method but seems to give reasonably satisfactory results. It has the advantage of a single kilowatt-hour meter and the avoidance of demand-indicating devices.

It has been suggested that a similar form of rate might be applied to commercial lighting with a view to encouraging high load factor and a high standard of illumination, on the assumption that kilowatt-hours representing not only extended hours of use but also unusually high intensity of illumination would be billed at a comparatively low rate. The variation in requirements of normal illumination, as, for example, between jewelry stores, restaurants, and warehouses, has prevented the general use of any such commercial schedule.

Determination of Demand.—The problem of suitable determination of demand under the various rate schedules above described has been given much attention. Accurate and inexpensive meters are available for indicating during any desired period the maximum load which has existed at any time during the period. If the time when the maximum demand occurs is significant, more expensive recording instruments are necessary, including clock or motor mechanism, graphic charts, or printing or other devices. Even the less expensive indicating instruments are too costly for the use of small customers, and it is common practice to base demand charges upon connected load, or some fraction thereof, or periodical tests of actual demand, or other agreed methods, such as the area basis referred to above.

Certain other problems connected with demand deserve attention. One involves the length of the demand period. Momentary loads are not measures of demand but, rather, the average load during defined brief periods, usually between 5 and 60 minutes. Sometimes several such periods are averaged. Furthermore, the prescribed demand on which bills for demand service are based may be fixed by the record of the current month, the year ending with that month, or the contract period to date. All these various definitions of demand and demand period are steps to the securing of equitable revenue to cover fixed costs of service. Investment is not affected by a single demand lasting only 5 minutes, and rarely by a recurrence of such demands. A 30- or 60-minute demand will affect investment, and a 60-minute demand will usually be less than a 30-minute demand. The average of three or more demands in any month will be lower than the highest of these demands. A cumulative yearly demand will be higher than most of the monthly demands included therein. The contract period demand may still be higher. It follows that a certain needed demand revenue requires a higher unit demand charge as the demand period is lengthened, and as the number of daily, monthly, or annual demand records, from which a prescribed contract demand is selected, is reduced. The tendency in demand definitions seems to be toward the highest 30-minute average during the year ending with the month for which the bill is to be rendered. This gives the utility a reasonable time within which to make other disposition of facilities which a given customer has permanently ceased to use, and involves

a lower unit charge than the monthly demand which is still in common use.

Power-factor Correction.—Still another and somewhat obscure factor involved in power service needs brief mention. Induction motors and other devices on alternating-current circuits involving electromagnets cause low power factor, this being the relation between the actual energy measured in kilowatts and the apparent energy as measured in kilovolt-amperes. The difference between the two is the wattless energy required to magnetize the motors and other devices connected with the circuits. Magnetizing current, being nearly constant at all loads, becomes proportionately large when the apparatus is lightly loaded. Low power factor increases the current required for a given amount of power, with corresponding increases in the size of line conductors, transformers, meters, and generating apparatus. When power factor drops to about 70 per cent, which is not rare, the heating effect of the current required for a given power is double that at 100 per cent power factor. This does not, however, require a corresponding increase in rated capacity of equipment. Small and underloaded induction motors are the common sources of low power factor which add substantially to the cost of power service, primarily through added investment, but including some added line losses and other operating expense.

Electric companies have come to appreciate the seriousness of low power factor to the extent that clauses are frequently included in rate schedules for wholesale power imposing penalties for power factor below certain limits, usually about 80 per cent, which is the common basis of the kilowatt rating of generators. Such clauses, while helpful, do not accomplish all that they should. By careful attention to motor installation and by use of synchronous motors, power factors may be raised to 100 per cent or thereabouts without difficulty, although where synchronous motors, are used the installation cost is appreciably increased. On the other hand, the saving to the electric companies through such increased power factor justifies something more than a penalty, and a reward for high power factor has, in fact, been provided in an appreciable number of modern rate schedules. Studies of this subject have shown that a bonus program for high power factor can be developed which will more than compensate the customer for the added investment necessary to secure such

power factor and at the same time save the electric company more than the amount of the bonus through capacity in stations and lines released for other service.

As a substitute for power-factor adjustment clauses, it has been proposed, and to a limited extent put into practice, that demand charges under the Hopkinson form of rate should be measured in kilovolt-amperes rather than in kilowatts. Such a measurement would automatically correct for the increased investment which low power factor requires. In fact, it would to some extent overcorrect because certain parts of the investment, such as boilers and steam accessories, are not affected. On the other hand, such overcorrection helps to offset increases in operating expenses which low power factor entails. In spite of the fact that accurate measurement of kilovolt-amperes involves complicated and expensive instruments, which are still in the development stage, it is not improbable that this basis of demand measurement will have more extended future use because of its simplicity and general fairness.

Fuel Clauses.—The wide fluctuations in recent years in the price of coal, which constitutes a large part of the cost of electric service, have necessitated some means of adjusting existing rates to take care of varying fuel costs. In retail service such adjustments are unimportant unless there is a wide change in fuel costs, because such costs constitute a comparatively small part of retail service charges. This is not true in the case of large power businesses where the fuel cost may amount to more than 50 per cent of the total charge for power. A moderate change in the cost of fuel might, therefore, under such circumstances change a business that was profitable into one involving appreciable loss.

To take care of such fluctuations in cost, fuel clauses were developed to take the place of intermittent changes in the rates themselves, these clauses having the advantage of automatically adjusting the rate to changes in cost of service. In its conventional form the fuel clause provides that for each increase or decrease of 5 cents or major fraction thereof in the price of coal of a specified character from the base price upon which the rate schedules is predicated, there shall be a certain addition to or reduction from the rate per kilowatt-hour charged for electric energy. The unit correction is a very small fraction of a cent per kilowatt-hour, ordinarily in the vicinity of 0.006 cent, the amount varying with the unit coal consumption of the plant and

the efficiency of distribution. Where fuel oil is used instead of coal the correction is usually based on each variation of 1 cent per barrel in the delivered price.

In either case the adjustment in the rate involves odd fractions of a cent and corresponding billing complications which are objectionable if the number of customers involved is large. It is unusual to apply such fuel clauses to retail business because of the billing complications and the comparatively small amount of additional revenue involved, which in some cases would not even pay for the cost of the computations. A considerable number of fuel clauses have been designed in which the adjustment is simpler than that outlined above. For wholesale power, corrections are made in steps of 1 mill or even fractions per kilowatt-hour, and the change in price of fuel in cents per ton or per barrel, corresponding to such change in rate, is stated in the fuel clause. Where it is desirable to apply fuel clauses to retail business the range in fuel price may well be stated for each ½-cent change in the rate. A fuel clause of this form simplifies accounting work to a material extent and permits a wider application of the fuel clause than would otherwise be expedient.

While fuel clauses are in common use throughout the country, they have not found favor with all regulatory commissions. Among the reasons which certain commissions have stated for disapproving fuel clauses are the following:

If a change in price of fuel occurs, involving a change in rate, such change cannot legally be made because it is not specifically a part of the schedule filed with the commission, unless at the beginning of each month the company files with the commission the fuel clause correction to be made during that month and further conforms to the commission's rules as to publication in its offices and elsewhere. It has been held that fuel clauses involve complications undesirable in a retail lighting business and should not be approved for such purposes by the commissions.[1] It has further been held that the contention of certain power customers, that they were entitled to know in advance the exact cost of their power, which would be impossible with a fuel clause, was reasonable, and that no fuel clause would be permitted.[2] Such a ruling, in the light of the fact that no manufacturer operating his own plant could definitely

[1] *Re Rochester Gas & Electric Corp.* (N. Y. II), P.U.R. 1921 A, 415, 417.

[2] *Re Montpelier & Barre Light & Power Co.* (Vt.), P.U.R. 1921 D, 145, 149.

forecast his power costs because of fluctuating costs of fuel, labor, repairs, and sundries, is obviously illogical.

In spite of such unusual objections, fuel clauses have served a very useful purpose in bringing about closer adjustments of rates to costs than would be practical under recurrent changes in the rates themselves. Where substantial changes occur in power-plant efficiency, such as are incident to the installation of larger and more economical units, the correction factor in fuel clauses should be adjusted. If such adjustment would favor the customer, its postponement adds unduly to the revenues of the company. In order to avoid any possibilities of unfairness by such means some companies have adopted fuel clauses in which the correction factor is based on the number of kilowatt-hours produced or delivered per dollar of fuel cost. Obviously, such a fuel clause is more complicated than the conventional one, and for that reason is not commonly used, at any rate unless a material change in power-station efficiency is to be expected.

Flat Rates.—The flat rates for lighting service which were initially in general use still survive, although applied only to such service as street lighting, signs, show windows, and other display purposes for which the hours of service and number and size of lamps are definitely fixed. Under such conditions a flat rate in dollars per month for a specified service is not only permissible but preferable because of its simplicity and its assurance of uniform costs for possible comparison with other forms of advertising.

Prompt-payment Discounts.—No consideration has so far been given to prompt-payment discounts. The conventional practice is to allow a discount of 10 per cent if bills are paid within ten days from the date of their receipt. The purpose of such a discount is obviously to insure voluntary payment of a large number of small accounts, the collection of which by the usual methods would cost more than the discount. With large customers the amount of such discount is much greater than that necessary to secure prompt payment. Furthermore, if payment is overlooked for a day or two and the discount then denied, the customer feels aggrieved because the penalty is obviously inconsistent with the usefulness of the money during the period in question.

The feeling is rapidly growing that the 10 per cent prompt-payment discount is undesirable. Many companies have

entirely abandoned discounts, thereby securing the advantage of a lower published maximum rate, and these companies report no difficulty in securing payment of their accounts within a reasonable time. Other companies which have not felt justified in wholly abolishing prompt-payment discounts have established a sliding scale, which has advantages, including simplicity. This discount schedule provides for 5 per cent on the first $25 of monthly bill, plus 1 per cent on the excess, the discount for large bills amounting always to 1 per cent plus $1. If 5 per cent is not a sufficient inducement for the prompt payment of small accounts, this schedule may easily be modified to 10 per cent on the first $11.11 of monthly bill, plus 1 per cent on the excess, the discount for large bills being, as before, 1 per cent plus $1.

Minimum Charges.—It was at one time an almost universal custom to have a minimum charge of $1 per month for each lighting customer. This minimum was often higher for power customers. The practice with respect to minimum charges has changed materially in recent years in favor of an annual instead of a monthly minimum or the entire abolition of the minimum. In theory, this abolition cannot be justified since certain expenses, as well as carrying charges, continue whether the service is used or not, even in the case of the smallest customer. Many analyses have been undertaken to show the extent of so-called customer costs, *i.e.*, those costs which are independent of quantity of commodity or extent of demand but which are substantially the same for all customers. The results of these analyses have usually shown costs lying between 50 cents and $1 per month. If no charge is made for such service, the costs must be borne by other customers, and in some cases this burden may be unreasonable. In other cases it may be so small as not to justify the complications and annoyances of minimum charges.

Three-part Rate.—More than twenty years ago an effort was made to put into effect a demand form of rate which had, in addition to demand and energy charges, a separate customer charge of the order indicated above.[1] Such a rate was never popular, and the complications involved seem not to be justified, although its use has recently been extended in the Middle West.

[1] Doherty, Henry L., "Equitable Uniform and Competitive Rates," *Proc. Nat. Elec. Light Assn.*, 1900, p. 291.

It is a simple matter to combine the customer charge with the demand charge, yielding the same revenue and avoiding the apparent complications. For example, if \$2 per month per kilowatt is a suitable demand charge, a demand schedule which charged \$3 for the first kilowatt of demand and \$2 for all excess kilowatts would involve the equivalent of a \$1 customer charge.

Selection of Rate Forms.—The above outline covers the forms of rates in common use by electric companies in the United States. A study of the actual rates in effect will disclose very many needless modifications and complications, the results of the whims of local officials or the dictates of customers or regulatory commissions. It will be found, however, that most existing rates are of the block or the Hopkinson demand form, with modifications and combinations. The bulk of retail business is done under some form of block rate. Under such a rate some customers pay more than cost and others less, but the simplicity of the rate and the non-competitive character of the business justify its continuance. The same form is also used for small power businesses and other special purposes, but large power business commonly employs the demand form of rate. The complications which this rate involves are not objected to by large customers because they can understand the necessity for them and encounter their equivalent elsewhere in their business dealings. Many companies find it desirable to have alternative rates for all ordinary classes of service, so that a customer may select a simple or complicated rate or choose the one which under existing circumstances will involve minimum cost The very fact of such alternatives and the consistent choice of the more favorable schedule in each case necessarily mean that both rate schedules must be higher than either alone without an available alternative.

Equivalent Results from Different Rates.—Similar results, as far as cost of retail service is concerned, may be obtained from schedules of widely different forms. As an illustration, four different rates have been set up in the step, block, Wright, and Hopkinson forms in Table XI.

TABLE XI.—DIFFERENT FORMS OF RATES YIELDING SIMILAR REVENUE

Step Rate

Kilowatt-hours per Month	Cents
0 to 18	10
20 to 89	9
100 to 262	8
300 to 858	7
1,000 to 1,667	6
2,000 to 3,000	5
5,000 to 10,000	3
Over 15,000	2

Block Rate

Kilowatt-hours per Month	Cents
First 25	10
Next 175	8
Next 800	6
Next 2,000	4
Excess	2

Wright Demand Rate

Kilowatt-hours per Month	Cents
First 30 per kilowatt of demand	10
Next 200	8
Next 800	6
Next 2,000	4
Excess	2

Hopkinson Demand Rate

$2 per month per kilowatt of demand
7 cents per kilowatt-hour for the first 200 kilowatt-hours
6 cents per kilowatt-hour for the next 800 kilowatt-hours
4 cents per kilowatt-hour for the next 2,000 kilowatt-hours
2 cents for the excess

Figure 6 shows the resulting rates per kilowatt-hour from the above schedules up to 1,000 kilowatt-hours per month, beyond which point the similarity continues. The two demand rates are applied to 1-kilowatt demands, which means that the possible consumption is limited to 730 kilowatt-hours per average month. For other demands the same consistency would not be shown, but other schedules could readily be developed showing equal consistency for any demands. In practice, such consistency would not be sought in a large business where load factor rather than kilowatt-hours is of primary significance.

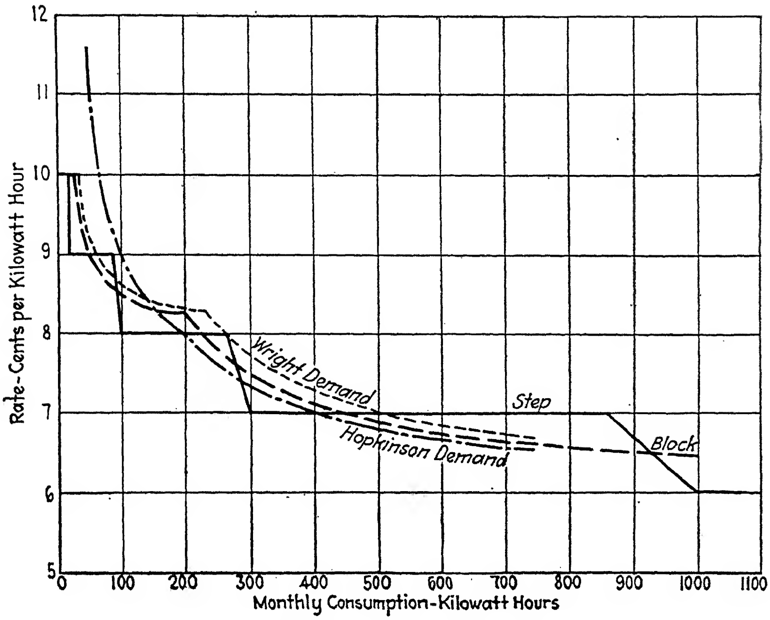

FIG. 6.—Similarity in results from rate schedules of radically different form.

GAS RATES

Gas rate structures are simple as compared with the electric schedules heretofore discussed. Many gas companies still maintain a straight rate for all consumption regardless of volume. A larger number have block schedules intended to encourage large domestic and industrial use. Gas rates do not need the complications of electric rates, as costs are not subject to such wide fluctuation. Electric service must be produced at the moment it is sold. Gas may be manufactured at a uniform rate throughout the day, the difference between uniform production and fluctuating consumption being taken care of by storage holders. Gas companies recognize that their costs are by no means uniform per unit of product, and in many recent cases where their revenues were deficient they have sought to apply a service or customer charge, independent of gas sales, instead of an increase in the rate for gas, in an effort partly to correct the inequities involved in a uniform or block rate.

Refinements for Wholesale Service.—Gas companies have recently come to a realization that there is a promising field for

their service in house heating, where coal or oil is now used. Large industrial plants are also appreciating the advantages of gas in place of other fuel. Such wholesale uses have necessitated refinements in gas rates which were not previously needed, and it is interesting to note that these refinements involve more factors than those in wholesale electric rate schedules. In addition to customer and commodity costs, gas companies have two kinds of demands whereas an electric company has only one: manufacturing demand and distribution demand, the latter being injected because of the holder capacity and its equalizing effect. A recent report of the Rate Committee of the American Gas Association contains an interesting analysis of cost factors and develops a four-part rate applicable to a particular property, which will serve as an illustration of such rates.[1] The details of this rate are as follows:

Demand charge, daily...........	$0.36 per month per hundred cubic feet
Demand charge, hourly..........	2.50 per month per hundred cubic feet
Commodity charge..............	0.50 per thousand cubic feet
Customer charge...............	0.95 per month

Very few gas companies have had the courage to put into effect rate schedules involving all the independent variables above enumerated, and, as with electric rates, expediency will probably dictate simplification to the extent of the elimination of one or two of the variable factors, at least for ordinary business.

FARES

There remains for consideration the charges of the third class of public utilities with which this book primarily deals, namely, electric railways. The United States is well known as the exponent of a uniform fare for urban transportation regardless of distance. This is in marked contrast to European practice where zone fares are in general use, the zones ranging from something like a half mile to a mile in length. The zone-fare collection complications which would be considered serious in this country do not seem to be troublesome abroad, and the zone system undoubtedly encourages short-distance riding.

The straight urban-fare system has been adhered to in the United States, in part because of its simplicity, but also because

[1] Report of 1923 Committee on Rate Structure, American Gas Association, p. 17.

of the popular belief that it has tended to prevent congestion of population in the larger cities. The attempt has been made to give to the laboring man, as well as to more prosperous citizens, the advantages of outdoor life, opportunities for gardening, and safe playgrounds for children. Although such motives are undoubtedly laudable, it is not clear that they have accomplished the desired purpose. Contrary to popular impression, the maximum congestion of population does not exist in European cities having zone-fare systems but in the United States under the prevailing flat-fare system. The greatest population density in the world is found in the city of New York, which in certain districts has 360,000 people per square mile. The maximum density in any other country in the world is less than 200,000.[1]

Zone Systems.—In spite of the general adherence to a uniform fare, there have been some notable experiments with zone systems, which, however, have differed from those in Europe in having a uniform-fare central area containing a substantial proportion of the riding public. Surrounding this area are zones about 1 mile in width, for each of which a supplementary fare is charged. Milwaukee is the best example of this system. Other citites have also restricted the urban area to which their base fare applies, charging a supplementary fare for outlying areas, sometimes but not always at a lower rate.

Most of these systems are the outcome of the need of higher fare following the World War. The results of our zone-fare experiments have not been wholly encouraging. There have been two notable examples, in New Jersey and Connecticut, where elaborately designed systems have been put into effect and promptly abandoned. In both these cases, however, reasons other than the characteristics of the fare systems themselves were held responsible for the abandonment. It is doubtless true that increases in straight fares have their economic limitations, and each such increase means that a certain number of former patrons cannot or do not afford the higher fare for comparatively short rides. The loss of these patrons means that the average length of ride increases and, therefore, the cost of the average ride, which tends to make another increase in fare necessary. Such a further increase means a further reduction in patronage, an increase in the average haul of remaining pas-

[1] Doolittle, F. W., "Studies in the Cost of Urban Transportation Service," p. 252.

sengers, a further cost per passenger, and a further increase in fare, and so on. Obviously, there are limits beyond which a single fare would not be effective. A central-area fare, not high enough to cover long-distance riding, encourages short-distance patrons, who are the most profitable ones, and the higher fare which is charged long-distance riders is not only justified by the distance but is less subject to effective competition.

It is, therefore, to be expected that some form of zone system similar to those already used in this country will have more extended use in the future, although such use may be restricted to cases where a uniform fare results in material loss in traffic. The rate of fare at which such loss becomes serious has not yet been closely determined because of limited experience and disturbed economic conditions. The rate of fare now in use in American cities varies between 5 and 10 cents, with 7 cents as the most common rate, but with 8 cents and 6 cents in extensive use depending upon the characteristics of the cities.

Weekly Pass.—Various means of avoiding odd fares have been proposed, including a novel fare system known as the weekly pass. This system was first put into effect in Racine, Wis., in August, 1919, and is now in use in from thirty to forty American cities. This system involves a fixed weekly payment for a so-called "pass," entitling the holder to an unlimited number of rides without additional payment. Usually the holder may be either the purchaser of the pass or anyone to whom he may loan or transfer it. In effect, therefore, this system involves the possibility of practically continuous riding throughout hours of car operation for a fixed sum per week.

This is a radical departure from former practice, and, in spite of extensive advertising, has not met with widespread popularity except as a means of meeting unusual conditions, particularly the existence of jitney competition. It is logical that where jitney service is unorganized the possibilities of unlimited riding on street cars would be disastrous to jitney business, and such has been the experience. Under more normal circumstances it is difficult to see how a practice corresponding with that initially adopted by electric companies but abandoned thirty or more years ago as inequitable can now be logically adopted by electric railways.

The proponents of the weekly pass claim that the holder, if using the pass during rush hours, would have also used the cars

at that time under conventional fare systems and that, therefore, no increase in transportation facilities is required. If at other times during the day the holder of the pass sees fit to use cars not otherwise filled to capacity, he is adding little if anything to the cost of service. It is further contended that the holder of a pass will frequently invite friends to ride with him and pay cash fares which would otherwise not be secured.

A study of the experience with the weekly pass indicates that riding is materially increased but that the total revenue which the traffic yields is not substantially greater than under previous fare systems which were inadequate. This is true at least where jitney competition has not been a controlling factor in the situation. If an increase in revenue is the real reason for a change in rate of fare, the weekly pass has not been a pronounced success, and in certain cases where it has been adopted to eliminate jitney competition it has been abandoned after this result has been accomplished. The usual charge for the weekly pass is from $1 to $1.25. The total number of daily rides per passenger averages between four and five, a material increase, of course, over the riding under the conventional fares. It is further claimed for the weekly pass that it has promoted good feeling in the communities where it has been employed, and such good feeling is always an asset.

Nickel Permit.—Another system less extensively used, possibly because it has not been so widely advertised, has advantages which apparently have so far not been wholly appreciated. This system, sometimes referred to as the "nickel permit" system, involves the payments of a 5-cent fare for each ride by the holder of a permit costing $1 per month or thereabouts, as an alternative to a 10-cent or other comparatively high cash fare. The charge for the monthly permit would logically be adjusted to cover that part of the total cost of service not yielded by the cash fares. So long as the cash fare remained at 5 cents a moderate change in the cost of the permits, purchased once a month, to adjust revenues to service costs would not be a matter of concern. Furthermore, the familiar old 5-cent fare, materially less than present prevailing rates, should have an appreciable stimulating effect and also serve to eliminate unorganized jitney competitition which may exist.

This form of fare has the same logic as the Hopkinson form of electric rate, previously described, in that the car rider pays for

the facilities provided for his accommodation whether he uses them or not, paying in addition the cost of the service which he actually uses.[1]

The alternative 10-cent fare, which is commonly used in connection with the nickel permit, is justified on the grounds that occasional patrons are served at higher cost than regular patrons. Such patrons walk or use their automobiles in pleasant weather, and if they demand and secure adequate accommodations during unpleasant weather, such accommodations mean infrequently used investment and high fixed charges per ride. If, on the other hand, additional facilities are not furnished for occasional riders, they may fairly be penalized for the inconvenience which they occasion to regular riders, thus justifying the lower fares charged to regular riders which the higher fares to occasional riders permit. As between the weekly pass and the nickel permit, it appears that the latter has greater advantages in equitability, revenue-stimulating possibilities, and readiness of readjustment to changes in cost. Although the nickel permit so far has been used in only about a dozen American cities, its more extended use in the future may logically be expected, consistent with the increasing use of demand electric rates.

Study of Fare Systems.—In 1920 the Committee on Fare Systems of the American Electric Railway Association made a thorough study of the rates and character of fares then in effect, and secured the opinions of a large number of electric railway executives as to the maximum uniform rate of fare that could be put into effect without substantial loss in traffic.[2] It was the general opinion at that time, and conditions have not since materially changed, that 10 cents was not an excessive rate for a cash fare, provided a lower ticket rate, if permitted by service cost conditions, was used therewith. It is undoubtedly a fact that the use of odd change for carfares several times a day is annoying, and regular riders do not object to purchasing a considerable number of tickets at a time in order to avoid the use of pennies. It is probably true that the annoyance caused

[1] Nash, L. R., "The Possibilities in Readiness-to-serve Fare Schedules," *Elec. Ry. Jour.*, Sept. 27, 1919, p. 647.

[2] *Proc. Amer. Elec. Ry. Assn.*, 1920, p. 167.

by penny change for carfares is responsible for more of the resentment against fare increase than any other factor aside from political and newspaper agitation. Experience with the sale of other commodities at higher prices during and since the World War does not indicate that increases similar to those which have been made in carfares are seriously regarded by the average citizen.

Effect of Fare Reductions on Riding.—There may be significance in the experience of certain electric railways which put into effect before the war rates of fare less than 5 cents through the sale of six or more tickets for 25 cents. The author made a careful study of the experience of all such cities in the United States from which definite data were obtainable. The pertinent factor in connection with such changes is the revenue rides per capita, an increase in such rides indicating that the public appreciates a reduction in carfare even if only a fraction of 1 cent. The studies referred to, which involved revenue rides per capita for a series of years before and after a reduction in fare, indicated no appreciable increase in riding which could be attributed to a fare reduction. If at that time the average street-car patron was not interested in a reduction in fares, it should be equally true that he is not now concerned over a similar increase which involves no greater collection complications; for, as has been pointed out, the present increased fare is a smaller proportion of the average income than was the 5-cent fare in earlier years.

It has, nevertheless, been urged, in opposition to fare increases in many recent cases, that a restoration of the old 5-cent fare would so stimulate riding as to yield greater net revenue than a further increase in fare. Such contention should not lightly be ignored but, rather, studied in the light of available actual experience. The best data seem to be from the Seattle municipal railway, which in 1923 put into effect a straight 5-cent fare in place of 10 cents cash, 3 tickets for 25 cents. A careful analysis of published figures[1] shows no material increase in riding, and the revenue losses were so great that the previous higher fare was promptly restored without loss in traffic. If, under such test conditions, anticorporation or other disturbing propaganda not being applicable, no change in riding habit occurred with unprecedented wide changes in fare, it is indicative that reasonable, necessary increases in fare should result in no marked loss in

[1] *Elec. Ry. Jour.*, Nov. 10, 1923, p. 825.

traffic except such temporary loss as may be chargeable to newspaper or political agitation.

RATE DESIGN

This chapter has so far dealt with the forms of rate structures and fare schedules in common use. The situations for which it is necessary to design schedules for entirely new business without data as to the character of this business are comparatively rare. On the other hand, increases or decreases in rates or fares to meet corresponding changes in costs are common, and this is the usual problem of the rate expert. It is a comparatively simple matter to estimate the change in revenue from a proposed change in rate or the rate necessary to bring about a prescribed change in revenue when the revenues and units of service from existing business are available. The problem is particularly simple when modifications are made in rates of a particular form, such as, for example, a change in the size of blocks or rates applicable thereto in an electric block schedule.

In changing from one form of rate to another computations are more complicated, and more complete data are necessary. Where the number of customers involved is not large, complete calculations of revenue under old and new rates may be made. Where the number of customers is large, satisfactory results may be secured by selecting a representative group of customers, which group has average revenue, kilowatt-hours, and other pertinent characteristics closely corresponding to those of the entire group of customers involved. This selected group of customers may then be analyzed and the percentage change in revenue found for them applied to the entire business affected. When opportunities for voluntary reductions in revenue occur it is always advisable to make a survey of the entire system of rates, with a view to determining the particular points which are out of line, and to make reductions where maximum results in the way of increased stimulus or efficiency will occur. For example, if a step schedule of retail electric rates is in effect and it is desired to change to a block form, the change should be made at a time when an appreciable loss in revenue is permissible, for, otherwise, certain customers may have their rates appreciably increased in spite of most skillful efforts to make a close translation from one form of rate to the other. This situation is clearly shown in the rate comparisons in Fig. 6.

TENDENCY IN RATE STRUCTURES

While the present tendency in rates, both wholesale and retail, seems to be toward added complications rather than simplicity, the advantages of the latter should not be overlooked, at least where retail service is involved. The average customer cannot be expected to understand the intricacies of public utility service, and it is not clear to him why public utility business cannot be transacted in as simple a way as other business. Take, for example, the supply of domestic fuel requirements. This involves storage yards and perhaps wharves, delivery teams, delivery and office employees, administrative costs, fixed charges on supplies of fuel, credit to customers, bad accounts, and other incidental factors. A coal man might easily figure that, instead of charging $16 per ton for coal, he might more equitably enter into a contract under which he would charge his patrons $6 a year as a customer charge to cover accounting and miscellaneous expenses, $5 a month for fixed charges on storage facilities, stored fuel, horse feed, etc., and $10 per ton of coal delivered. Such a schedule of charges might be wholly equitable, encourage liberal use of fuel, and be otherwise advantageous to the dealer. But another dealer who charged $16 per ton for coal would probably get the business.

CONTRACT FORMS

Public utilities also have a habit of drawing elaborate contract forms and formulating intricate rules and regulations covering their service when the risks which they run are often no greater than that assumed by the grocer or ice man who asks for no contract whatever. Wisely, the practice is growing among the public utilities of abolishing elaborate contracts, at least for retail business, substituting therefor a simple application for service, which, if written (as is not always the case), merely provides that service will be furnished under prevailing rates and under rules and regulations approved by the public service commission having jurisdiction

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CHAPTER XI

TAXATION

Although the purpose of this chapter is to consider special forms of taxation to which public utilities are subject, a preliminary word regarding the general subject of taxation may be appropriate. While the primary purpose of taxation is the support of governmental agencies through which rights to "life, liberty, and the pursuit of happiness" are assured, governmental activities have spread into many fields foreign to these fundamental purposes, with a necessary resulting increase in taxation.

It is the intent of the laws that taxes shall be equitably imposed—in other words, that in any particular taxing district the rates shall be the same upon all property or income of a particular character. Such equality is effective, at least to a reasonable extent, in taxation of real and personal property, income and inheritance taxes, and poll taxes. The same is true with respect to special taxes upon corporations as between such corporations or classes thereof, but is less true of certain business taxes or licenses upon intangibles, franchises, etc., with which public utilities are especially concerned.

GENERAL INCIDENCE OF TAXATION

It seems to be the general practice in taxation to conceal the real incidence as far as possible, the problem being, to use a homely expression, "to pluck the most feathers with the least squawking." Because of this procedure, the real extent of tax burdens is not appreciated by the average citizen. The total of all taxes collected annually by the various taxing jurisdictions in the United States, including federal, state, county, city, and special district, is now more than $7,500,000,000 as compared with about $2,000,000,000 ten years ago. Of this total more than $3,000,000,000, or about 40 per cent of the total, is collected by the Federal government.

Although Federal taxes are now steadily decreasing, all others are showing rapid and disturbing increases. The average per

capita taxation for all governmental purposes is about $70 per annum, or something like $300 per family, which means that the average householder has to work about one day a week for the support of his government. This fact is rarely appreciated. The average wage earner, owning no property and paying no income tax, is apt to assume that the support of government, other than for nominal poll taxes, comes from more prosperous citizens. As a matter of fact, taxes are finally paid by the ultimate consumer. Therefore, when the wage earner pays rent and buys fuel, food, clothes, and public utility service, and indulges in amusements, he contributes his share in taxes. To a certain extent he pays more than his fair proportion because those upon whom the taxes are directly imposed are apt to add a margin for contingencies in passing them along. Furthermore, there is an increasing habit of investing savings in securities wholly or partially exempt from taxation, the larger the individual savings the greater being the incentive to such investment.

It has been estimated that the total wealth existing in the United States is not far from $320,000,000,000, of which amount more than $50,000,000,000 is wholly or partially exempt from taxation. About 60 per cent of this exempt amount is said to be in securities, the balance being in real estate and other property publicly owned or belonging to educational or other institutions. The effect of such exemption upon the cost of money will be given consideration in another chapter. Its effect upon direct taxation is, obviously, to make the rates of those who pay at least 10 per cent higher than if all except government-owned property were taxed.

SCOPE OF UTILITY TAXES

Turning now to public utilities, it is found that the same basis of taxation of real and personal property is applied as to other industries, except that there are possibilities of assessing the special kinds of property owned by public utilities at unusually high rates because such property cannot readily be removed from the taxing jurisdiction in which it was originally located. Other kinds of business not requiring extensive special investment can move from one jurisdiction to another if taxation becomes oppressive, and such movements have taken place to a material

extent from states where unusual or experimental systems of taxation have been devised.

Public utilities render a service essential to the public welfare, and such service cannot be suspended or withdrawn without the approval of public authorities, very rarely granted because of excessive taxation. Even if such removal were authorized, its cost and the losses incident thereto would usually be prohibitive. In actual practice, public utilities are very frequently, although not universally, assessed at higher rates than other tangible property. This is particularly true where state laws require assessment at 100 per cent of value, such assessment being more rigidly adhered to with public utility and other large corporations than with smaller, less conspicuous, property.

SPECIAL UTILITY BURDENS

Public utilities are also subject to business licenses, income taxes, capital stock taxes, and other imposts, similar to other business corporations. In addition to these various conventional taxes public utilities are subject to assessments and imposts of a special character to which general business is not subject or is subject only to a very restricted extent.

Taxes on Revenue.—A common form of utility tax is a percentage upon its gross revenues, gross income, or dividends, the first named being most frequently encountered. In most jurisdictions the rate is less than 5 per cent, but California has recently imposed taxes upon gas and electric companies amounting to 7.5 per cent of their gross revenues, and upon electric railways, 5.25 per cent which, however, are in lieu of other forms of taxes. Railway and electric companies occasionally pay special taxes on the poles and wires which they install upon public ways. Railways also pay a mileage tax on their tracks, and a special tax on cars. Even the income from advertising in the cars is sometimes subjected to a special tax.

Franchise Taxes.—In addition to or in place of some of these taxes, a so-called franchise tax is frequently imposed. For this purpose the franchise may have a fixed designated value taxable at the prevailing rate for personal property, or the value may be fixed by a process of capitalization of net earnings or of net income in excess of certain prescribed or assumed rates.[1] It

[1] Louisiana: Laws 1920, Act 233; 1922, Act 138. New York: See *Elec. Ry. Jour.*, Mar. 26, 1921, p. 601.

has been pointed out in Chap. III that under regulation, which is assumed to limit the profits under public service franchises to those generally obtainable in other business with similar risks, the opportunity to do the business which the franchise authorizes has no special value, and, therefore, the franchise should not be taxed.

SPECIAL RAILWAY IMPOSTS

In addition to these special taxes certain public utilities, particularly electric railways, are subject to additional imposts and burdens of a still more specialized character. They include payment for and maintenance of paving in connection with railway trackage, removal of snow, occasional street cleaning and sprinkling, and contributions toward the maintenance of traffic officers, street lighting, and, in a few states, the support of regulatory commissions. Free transportation is also almost universally required for policemen, firemen, and sometimes for other city employees not in uniform, and occasionally for mail carriers etc.

The extent of these requirements varies with the respective trading abilities or positions of railway and municipal officials in connection with franchise negotiations, which have already been considered. As an illustration of the extremes to which municipal officials may go in such matters, it will be of interest to examine the requirements embodied in a franchise covering an electric railway location on a particular street in a Pennsylvania community.[1] These requirements may be summarized as follows:

1. The construction by the railway company of a completely new Telford-macadam pavement 12 inches deep from curb to curb on the entire length of Yale avenue occupied within the borough.
2. The construction of footways of blue stone at each street intersection on Yale avenue.
3. The construction and maintenance of broken stone gutters with inlets into streams or drains along Yale avenue.
4. The sprinkling of Yale avenue in dry weather and whenever reasonably required to do so by highway committee.
5. The construction of sufficient drains across Yale avenue.
6. The construction of steel bridges over waterways the full width of the avenue with footways and railings on each side.
7. The installation and maintenance of 25 electric lights along Yale avenue.

[1] *Re Swarthmore* (Pa.), P.U.R. 1921 E, 252, 254.

8. The construction of a sidewalk on each side of Yale avenue from Harvard avenue to Crum creek and on the north side of Yale avenue from Swarthmore avenue to Harvard avenue.

9. The transplanting of all trees and hedges from the line of the sidewalk and the building of "a good picket pine fence" "in front of the property of Mrs. Johnson and others."

10. The construction and maintenance of a fence around the public school; and

11. "The said company shall at all times keep in good order both the roadway of Yale avenue for its full width from curbline to curbline and also the bridges, flagstones, and gutters along said route."

Although requirements as extensive as those listed above have rarely been duplicated, the paving of the entire width of the streets on which tracks are located is not wholly exceptional, the usual program, however, including only the space occupied by the tracks and about 2 feet on either side.

Street Paving.—The matter of paving requirements is of such importance and involves such a peculiar, sustained misunderstanding on the part of the public as to justify further consideration in addition to that contained in the earlier franchise chapter. Since horses ceased to furnish the motive power for urban transportation, and regulation came into effect, paving charges have been an unjust burden upon such transportation. As a rule, however, city officials have so far refused to take the steps necessary for relief from the requirements of long-term franchises, and their constituents have accepted their attitude with a surprising lack of protest or even interest in a matter so directly affecting them.

The apparent explanation of this anomalous situation is that the general public has not yet grasped the meaning of regulation and still clings to the old idea that the street railway business is inherently profitable and that any burdens imposed upon it which tend to reduce general taxation are to that extent a relief to all citizens. The popular pastime of attacking corporations, particularly public utilities, is as old as the corporate form of organization. It has been justified to some extent by corporate greed and arrogance.

Elected public officials may naturally hesitate to undertake what appears to be a championship of the insistent claims of a corporation for relief even when this relief is for the exclusive benefit of its customers. The time will come, however, when there will be general public recognition of the special conditions

surrounding public service, and the politicians who have persistently and perhaps clamorously clung to obsolete issues will find their following has deserted them for more progressive and economically wise leaders who will recognize the real public interests. Public utilities, particularly electric railways, are awakening to the urgent need of popular education in the economic issues of the business. A widespread program of education is under way in newspaper advertising and articles, particularly with respect to the paving situation.

Commission Views on Paving.—The views herein expressed regarding paving charges are not novel nor wholly modern. They have been confirmed by decisions of regulatory commissions covering a considerable number of years. The following quotations from these decisions are presented as representing the modern, enlightened views of the commissions on this subject. Reference is first given to the report of the Federal Electric Railways Commission, a special body appointed by the President of the United States in 1920 to investigate the electric railways and make the real facts as to their condition more widely known. This Commission held extensive hearings and examined many witnesses representing the industry, the public, and other interested parties. It was the consensus of opinion of practically all these witnesses that franchise taxes, paving charges, and other similar assessments were unjust burdens upon car riders and should be abolished. The Commission came to the same conclusion, as indicated by the following brief extract from its report to the President:

Effective public cooperation should be exercised by eliminating, in so far as it is practicable, special assessments for sprinkling, paving, and for the construction and maintenance of bridges which are used by the public for highway purposes. (*Proc.*, vol. 3, p. 2263.)

California.—It is clear, of course, that under the present system of accounting for capital expenditures and for operating expenditures, all paving expenditures made by the company are charged either to capital account or to maintenance account and that all such expenditures, without exception, must ultimately be borne by the public through the street car fares contributed by the company's patrons. The cost of all paving, therefore, is borne by the people who ride on the street cars. It is equally evident that it is not the people who ride on the street cars who profit by such paving. On the contrary, it can be demonstrated that they are the further losers because of longer running time, all kinds of delays and other handicaps to swift and efficient service. (*Re San Diego Electric Railway Co.*, P.U.R. 1920 B, 86, 106.)

Indiana.—The terms under which petitioner occupies the streets of Gary provide that it shall pave between its tracks, and a certain distance on each side of its tracks. The result is, that petitioner paves and maintains the 22 feet in the center of the principal street of Gary. This part of the main street of the city often, if not generally, happens to be the best part of the entire pavement, and is used by the jitneys, in common with all other traffic of the city. The results are: (1) that the street railway company paves and maintains a large part of the street used freely by "jitneys" which deprive it of revenue; (2) that the people who ride in the street cars pay higher fares than otherwise would be the case, to provide and maintain street pavement for other transportation agencies whose operation tends to increase the fares of street-car patrons. (*Re Gary Street Railway Co.*, P.U.R. 1920 A, 191, 197.

Nebraska.—It is common practice for cities of Nebraska, being served by electric railways, to require paving within the rails and for a certain distance outside of the rails at the expense of the transportation company. This requirement has the approval of statute, as well as of ordinance. It dates back to the time when street cars were hauled by horses and theoretically, at least, there was serious damage to paving in consequence. It was continued after the date of electric railway service on the theory that a valuable right within the city had been granted; that the franchise was a thing on which the company earned large returns; and that the city was merely relieving itself of certain expenses in return for the privilege granted to the transportation company. The situation is now quite different. By regulation within Nebraska, no value is given to franchise rights and no electric transportation company is permitted to earn on any such franchise value. These carriers are limited as to returns and can make no profits except a fair return on a fair value of the property. They are permitted to capitalize the cost of paving, to earn a fair return thereon, and to set aside, out of gross revenues, a sufficient amount for maintenance and ultimately for replacing of pavement. These amounts the public which rides the electric vehicle are required to pay in the rate charged for transportation. Obviously, the paving is of no moment to the rider within the electric car and he enjoys no benefits from it. Yet, under this practice, he is required to pay an expense which otherwise would be borne by the adjacent property owner or by the village itself, an expense for an improvement which is advantageous solely to the adjacent property owner and to those who use the streets in other manner than by riding in the electric transportation car. Under existing conditions, this is, in the opinion of the Commission, highly inequitable to those who must travel in the less luxurious manner provided by the electric trolley company. (*Re Omaha & Lincoln Railway & Light Co.*, P.U.R. 1921 C, 244, 247.)

New York.—The imposition of such a paving charge against an impoverished railroad such as this and against its passengers is unreasonable. It is not a sufficient answer that it is required or sanctioned by law. Passing a statute does not of itself make its requirements reasonable and when it results in situations such as this it should be properly amended. Therefore, the order in this case should provide that the rate of fare shall additionally be increased to correspond with any new paving charge if and when they

may be levied against the company or its receiver . . . (*Re New York & Queens County Railway Co.* (N. Y. Transit Comm.), June 24, 1924; *Aera*, August, 1924, p. 10.)

Oregon.—As we have heretofore asserted, this paving adds nothing to the efficiency or ease of operating the street railways, and is of no benefit to the Company nor its patron, the car rider. Such advantage, as is derived from its existence, accrues to the taxpayer or the general public, or, when more directly localized, to the abutting property owner; to the automobile owner or any other person who may have occasion to use the public streets. Yet, under the present system, this burden is placed upon the Company and must ultimately be paid by the car rider in the form of fares. The injustice is apparent. (*Re Portland Railway, Light & Power Co.*, P.U.R. 1920 C, 428, 439.)

Rhode Island.—Throughout the country it seems to be clearly the consensus of opinion on the part of those who have made a study of the problem, that the trolley companies should be relieved of franchise tax payments, and the obligation to pay for pavements, which are in effect an indirect tax upon the car rider. (*Re Rhode Island Co.*, P.U.R. 1919 F, 723, 744.)

Tennessee.—As everyone knows, the streets are for the use of everybody, and the cost of building and maintaining them should be paid out of the general fund derived from taxation, and not saddled exclusively on those who must necessarily use the street cars daily. (*Re Nashville Railway & Light Co.*, P.U.R. 1920 C, 1, 13.)

Utah.—The car rider and not the traction company ultimately pays the bill. The latter acts merely as the agency for collecting the charge. The patron of the traction company is not only paying for the cost of his transportation, but he is being required to contribute an additional sum to pave and keep in repair portions of the streets largely for the use of those who generally employ other means of conveyance. It is not contended that the Company should be relieved of the entire cost of street paving, because certain of the costs are peculiar to street railway construction, and are, therefore, directly and properly chargeable to the Company, as are also certain of the maintenance expenses, wherein these exceed upkeep costs of ordinary paving; but it, nevertheless, seems to the Commission that the present statute operates to place a disproportionate part of the total paving expense on the car rider. (*Re Utah Light & Traction Co.*, P.U.R. 1920 E, 833, 837.)

Manitoba.—The terms of the contract, requiring the company to pay certain paving costs, are open to the same criticism, whatever it costs to lay a pavement and keep it in repair, that is in excess of the cost of a similar pavement where no tracks are laid, should be borne by the company, but anything more than that is an unjust charge against the car rider, now that the utility is regulated by this Commission. (*Re Winnipeg Electric Railway Co.*, P.U.R. 1920 F, 879, 902.)

Indirect Jurisdiction of Commissions.—In many cases commissions have encountered franchise paving requirements over

which they have had no direct jurisdiction. In some of these cases jurisdiction has been taken indirectly through authorization of the railways to discontinue service and remove tracks from streets where cities had persisted in demands for paving or repaving which the railways were not financially able to meet. The *New York and Queens* case, above quoted, is interesting in that the Commission authorized in advance an increase in fare of 1 cent for each $100,000 or fraction thereof of paving charges levied upon the company, the increase to continue in effect until the revenue derived therefrom was sufficient fully to liquidate the paving charges.

The August, 1924, issue of *Aera* contains at page 48 a list, with details of conditions, of forty-six cases in which paving obligations had been abolished or relaxed in recent years. It will be noted that several states have taken such action through direct legislation or blanket orders of commissions. By such laws, regulatory orders, education, and otherwise, it is to be expected that paving requirements, other than for such repairs as may properly be chargeable to car service, will ultimately be abolished to the material advantage of street-car patrons.

A.E.R.A. Tax Committee Report.—The burdens of taxation upon electric railways have become so great that a special committee of the American Electric Railway Association was appointed to investigate the matter and report to the Association.[1] The data which this committee obtained from members of the Association applicable to the year 1922 indicate that the electric railways of the United States pay about $100,000,000 in taxes and imposts, or about 10 per cent of their total revenues. This amount is equivalent to about ¾ cent per revenue passenger, or from $5 to $10 per annum per regular car rider.

Of the total amount of taxes and imposts about two-thirds are in the form of taxes, the remaining one-third including paving costs, free transportation, and other charges of that general character. The propriety of including the original cost of paving in such tabulations might be questioned, but an analysis of the paving situation would probably show that the current costs of paving construction work would not be materially different in a normal year from the carrying charges upon the accumulate expenditures for paving which have been made during a period of years covering the life of the average paving installation.

[1] *Proc. Amer. Elec. Ry. Assn.*, 1923, p. 200.

Analysis of Railway Taxes.—A further analysis of taxes paid by electric railways shows that about two-thirds are taxes upon property and income similar to those paid by other corporations, the remaining one-third being franchise, earning, and other special taxes. It, therefore, appears that more than one-half of the total combined taxes and imposts paid by electric railways are special, and in excess of those paid by ordinary business corporations. The special taxes alone amount to more per patron than the normal poll tax paid by a non-property-owning car rider. The drain upon the resources of electric railways in recent unfavorable years through regular taxes alone has been a very serious burden. In New York State in 1922 they paid 45 per cent of their net income in taxes, an amount probably greater than that distributed in dividends.[1] In Viriginia the tax payments amounted to nearly 40 per cent.[2]

TAXES OF OTHER UTILITIES

Other classes of public utilities have not been subjected to as extensive special taxes as have electric railways, but their regular taxes have been somewhat higher on account of the more prosperous condition of their business. In 1923 the gas, electric, and telephone utilities in New England paid out more than 25 per cent of their gross income for taxes. It is estimated that electric and gas companies throughout the country pay about 8 per cent of their annual revenues in taxes.

The burdens of public utilities are not limited to those listed above. Under modern regulatory methods a formidable number and range of records and reports are required by the commissions, involving high clerical and executive costs. As an example, in a recent year the lines of the Pennsylvania Railroad east of Pittsburgh made 114,000 reports to the regulatory and other governmental agencies.

TAXES ON NON-UTILITY TRANSPORTATION

It may be of interest at this point to make a more specific comparison of public utility taxes with those paid by certain other classes of business. For this purpose electric railway taxes and those paid by competing transportation agencies have

[1] Davenport, F. M., "The Taxation Problem," *Aera*, March, 1923, p. 911.

[2] Forward, Alex, "Taxation in Virginia," *Aera*, March, 1923, p. 920.

been selected. Electric railways spend more than $100,000,000 annually in the current upkeep of their roadbeds, not including depreciation, or the maintenance of other parts of their property. The United States, directly and through its various political subdivisions, spent in 1921 more than $1,000,000,000 on its public highways. About 40 per cent of this total was raised through bond issues and presumably devoted to new construction. Fifty per cent came from general state and Federal taxation, including 5 per cent for taxes assessed upon vehicles and accessories. The remaining 10 per cent of the total expenditures came from direct taxation upon vehicular traffic, largely through taxes on gasoline. Fifteen per cent of the total, therefore, or $150,000,000, came directly from vehicles using the highways, of which a very large proportion was motor vehicles. It is safe to say that 95 per cent of the present wear and tear of public highways is occasioned by motor vehicles, which pay approximately 15 per cent of their cost, including construction expenditures, or 25 per cent of the current upkeep without either construction costs or interest on the accumulation of such costs.

Gasoline Taxes.—The balance of the cost of highway upkeep is provided through general taxation, to which public utilities, including electric railways, contribute. The contribution of the electric railways is in addition to the maintenance of their own trackage. Since 1921 the extent of taxation of gasoline for motor vehicle use has materially increased. Preliminary figures for 1923 indicate that the direct tax upon motor vehicles had increased from 15 to about 20 per cent, largely through gasoline taxes which were effective in about thirty-six states, with rates ranging from 1 to 3 cents per gallon.[1] Further increases in such taxes are to be expected and commended. A few other states have undertaken more adequately to impose the burdens of highway upkeep upon the users through high license fees, in certain cases these fees for heavy trucks amounting to more than $500 per annum. When the burdens of highway cost and maintenance are in such ways fully imposed upon the users, and the rates for highway transportation include such costs, in addition to more direct operating costs, a material increase in rates will be necessary and the electric railways will once more

[1] *Aera*, August, 1923, p. 73. See also "Motor Vehicle Regulation and Special Taxes," *Aera*, May, 1923, p. 1245.

compete on a more equitable basis with other carriers of passengers and merchandise.[1]

PROPOSED CHANGES IN UTILITY TAXATION

The subject of taxation of public utilities has been given careful attention by other special committees, including a legislative committee in the state of New York, which recommended radical changes in existing forms of taxation in the interests of equity between public utilities and other corporations. A committee of the Chamber of Commerce of the United States has also considered the subject and recommended a so-called "gross-net" form of tax in lieu of all other taxes, including those upon physical property. A committee on taxation of public utilities of the National Tax Association has also made a similar recommendation.[2] This tax would be imposed upon the gross earnings, but its percentage would vary with the profitableness of the business as disclosed by its net earnings. Objection would doubtless be raised against this form of taxation applicable only to public utilities, for, when net earnings became negligible, taxation would be correspondingly reduced, whereas other business interests would pay relatively uniform taxes regardless of the prosperity of their business. The reasons given by the proponents of this special form of tax lie in the public character of public utility business and the fact that public utilities include their actual taxes in their costs of service which are recovered through revenues from their patrons.

UTILITIES AS TAX COLLECTORS

The general public does not yet appreciate the fact that, with respect to taxes, public utilities merely serve as collectors, and that any special or discriminatory taxes imposed upon the utilities are not paid by their owners but, rather, by their patrons. The car rider of moderate means is helping to pay for the pavements which his more prosperous neighbor uses with his automobile, and the rapid increase in the number of automobiles has further led to such obstruction of the highways as to slow down

[1] Report of The Highway Finance Committee of the National Tax Association, 1924.

[2] Report of National Tax Association Committee, 1923, p. 403.

transportation speeds and otherwise increase the cost of electric railway service which the car riders must support.

TAX EXEMPTION

Some unbiased students of the problem of taxation have suggested that public utilities should be exempt from all taxation because any taxes imposed upon them are ultimately passed on to their customers. Such a view is not consistent with modern methods of public utility operation, which assume that the entire necessary cost of public utility service, but no more, should be paid by its users. Among the items of cost are the protection of property from fire, theft, other depredations, and confiscation, for which fire and police departments and courts are provided. Costs of this character assignable to public utility service should not be borne by the taxpayers generally, but, rather, by those who directly benefit from the service.

The utilities themselves do not object to the payment of consistent and equitable taxes upon their property. They believe, however, that they should be wholly relieved from special franchise taxes and taxes upon tracks, cars, poles, wire, and other equipment which, although located in or using the public streets, cause no more obstruction than other property or traffic and should not be taxed to any greater extent. Free or reduced-rate service, street lighting at less than full cost, cleaning and sprinkling of streets, and any other such service should not be imposed upon public utilities as a tax against the users of such service, but should more properly be taken care of through general taxation affecting all citizens.

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CHAPTER XII

TESTS OF UTILITY SECURITIES AS INVESTMENTS

An investor in corporate securities naturally seeks the maximum obtainable income consistent with that degree of safety of principal and stability of return which his circumstances require. The average investor is apt to rely largely upon the judgment of an investment banker who is acquainted with his particular circumstances and requirements. There are, however, many investors who prefer not to depend wholly upon such agencies regardless of their experience and reputation, but, rather, find pleasure and advantage in studying the investment market for themselves and selecting those securities which appeal to them as best meeting their needs. Independent procedure of this character, even if confirmed, as it should be, by the judgment of reliable bankers, calls for an intimate knowledge of the financial structure and income statements of the corporations whose securities are available and some acquaintance with their physical characteristics.

CONVENTIONAL TESTS

Although it is not possible within the scope of this book even to outline fully the wide range of matters which an investor should study, this chapter will undertake to review and comment upon certain standard tests of investment securities which are in common use. One naturally assumes that commonly accepted methods of determining the safety and stability of investments are based upon recognized financial and economic principles. An analysis of these methods, however, shows that this is not wholly the case and that certain methods will not bear close scrutiny nor yield entirely safe results. The laws of certain states define the conditions under which securities are eligible as saving bank investments. These conditions also are variable and to a material extent inconsistent.

BASIC FACTORS IN INVESTMENTS

In view of this situation, it may be helpful to investors, as well as of interest to engineers and other students of the industry,

to examine in some detail the financial structure of a normal public utility with particular reference to the fundamental relations which govern its successful operation. These fundamental relations having been established, if it is found that certain conclusions mathematically or logically developed therefrom with respect to investment securities are consistent with conventionally applied tests, these tests may be accepted; otherwise they should be used with reservations, if at all.

In the course of the examination of the subject some new tests will be developed as a substitute for or supplement to those commonly used. Although derived by analytical methods, they may be found of practical value, particularly in the light of their meeting the conditions of well-known, successful utilities. Before taking up the discussion of these matters in detail, some general statements regarding the conditions surrounding public utility investments will be appropriate.

The important factors involved in the selection of any investment security are safety of principal, rate and regularity of return, marketability, and taxation. An investor in public utility securities is also concerned with certain other factors peculiar to a large extent to the industry. They include franchise conditions, extent and character of public regulation, characteristics of the community served, public relations, and the attitude of the press.

Safety

As to the general factors first mentioned, the relation between safety of principal and yield is well known. With the maximum degree of safety, found in bonds of the United States and many of its political subdivisions, the obtainable yield at the present time is but little above 4 per cent. It is possible at times to obtain a yield several times as great from corporate issues which, however, involve a very wide range of security of principal and continuity of return. Naturally, the first decision which an investor should make concerns the degree of safety which he must secure for his principal. This important question decided, he finds that his available return is fixed within fairly narrow limits by market conditions.

Investors often forget that the yield from their holdings is made up of two factors: *interest* and *insurance*. The latter factor is negligible in stable government securities but is of very con-

siderable magnitude in so-called speculative investments, to be found particularly in the industrial and mining business. The yield from a speculative investment, whether in bonds or stock, is not wholly income, and a conservative investor who holds such securities should, for his future protection, divide the yield between income, which he may currently spend with safety, and an insurance reserve which should be accumulated against a possible loss of principal. Whether the income should be limited to 4, 5, or 6 per cent, or some other amount, is a matter for the judgment of the investor, depending upon the character of the investment, its total yield, and the extent from time to time of the reserve accumulated for protection against loss. The careful investor will also give consideration to the probability of a substantial change in the purchasing power of money during the life of a security or such other period as it may be held.

Marketability

The marketability of securities is of importance to some, although not all, investors. If there is reasonable assurance that capital need not be disturbed for long periods, a security which has no ready market, and for that reason has a somewhat higher yield, may be entirely satisfactory. If, on the other hand, it may be necessary to make emergency use of capital, sufficient securities for such purposes should be promptly salable. This means that they should preferably be listed upon stock exchanges in cities accessible to the investor or his brokers. Many unlisted securities, however, can be disposed of without serious delay, although possibly at some sacrifice.

Taxation

The question of taxation of securities or their income is of significance, particularly to large investors. It is not possible to consider this subject adequately in a brief space, but certain general features may be stated. The exemption, wholly or in part, of bonds of the government and its political subdivisions is of importance to all investors, particularly those subject to high surtax rates on their income. Corporate dividends are exempt from normal federal income taxes, although not from all state income taxes. Bond interest is subject to both federal and state income taxes, although in certain cases the corporations

issuing the obligations undertake, within limits, to assume the income taxes thereon. The laws of various states contain tax-exemption provisions applicable to securities of domestic corporations. Such provisions and federal income tax rates are all subject to recurrent changes, with all of which a discriminating investor should become familiar.

Special Factors

Franchises.—Turning now to the features particularly applicable to public utility securities, it is found that the terms of the principal franchises under which utilities operate deserve attention. This matter has already been discussed in Chap. III and does not need further amplification other than the reiteration of the statement that bonds running beyond the life of a franchise have not generally been favored by investors. The franchise term has less significance in connection with junior securities, and even in bonds the protection afforded by the broad powers of regulatory commissions has gone far in removing the disturbances incident to franchise renewals.

Character of Regulation.—The extent and character of public regulation to which utilities are subject is a matter about which investors are increasingly seeking information. The extent to which public utilities are regulated was discussed in an earlier chapter, and it is sufficient to say at this point that investors generally favor public utilities under state, as distinct from municipal, regulation, and prefer that this regulation include supervision and approval of security issues. Where, however, the decisions of regulatory commissions have shown political influence, as evidenced by low valuations, low rates of return thereon, or failure to allow for past losses, particularly under commission supervision, the securities of utilities under these commissions find less favor with investors or sell on a higher yield basis to compensate for the added risk. On the other hand, when the commissions show the same measure of protection to utilities and their investors as they do to customers and the public, and take further steps in recognition of efficiency and progressiveness, the securities find a ready sale and at lower yields.

Character of Territory Served.—The character of the community in which a public utility operates has more bearing upon its

success than is the case with other industries. These other industries, if local conditions become unfavorable, can move to other cities or states without prohibitive cost. Public utilities are fixtures in the communities where they have established their business with their markets normally restricted to these communities. Aside from regulatory restraints upon discontinuance of service, the property of public utilities is so distributed and fixed that it cannot profitably be removed for service elsewhere. If, therefore, a community, through lack of diversity in its industries or exhaustion of natural resources which have supported its activities, ceases to be prosperous, its public utilities are bound to suffer.

For such reasons it is wise to avoid investments in one-industry towns subject to disruption on account of strikes or other disturbances, in cities where radical influences may disorganize even a variety of industries, and cities which are experiencing or confronted with loss in prestige or population from other causes. Other unfavorable community characteristics less disturbing or permanent in their nature will also be considered by discriminating investors.

Public Relations.—The relations of public utilities to their patrons, the general public, and the city officials with whom they have business contact are of vital importance and will be given further consideration in a subsequent chapter. The attitudes of local newspapers also have a bearing which should not be overlooked. Certain newspapers find financial advantage in consistently attacking corporate enterprises, particularly public utilities. Although such papers may not have standing with individuals of influence, they are extensively read by people less capable of forming correct opinions of their own, thereby developing a body of public sentiment which may adversely affect municipal policies or legislation that would be in the interests of both the community and the utilities.

Occasions have arisen in which investment bankers otherwise favorably disposed toward handling the securities of a public utility have refrained from so doing because of active newspaper opposition to public utilities and to public officials who show any interest in their success. In other cases franchises and other similar important negotiations which, if concluded, would have been beneficial to the community, have failed because of similar antagonism of the press.

ADVANTAGES IN PUBLIC UTILITY SECURITIES

A casual investor may be tempted to ask why, in the light of the above hazards and complications, he should risk his funds in public utility enterprises. An adequate answer is that different and still greater risks are to be found in other classes of investment yielding a similar return. The stability of the public utility industry as a whole has been shown in Chap. II by comparison with other industries during a period of both extreme depression and unusual prosperity. It was there shown that no other group of allied industries showed as great stability of returns as public utilities. It should also be pointed out that utilities have very small inventories of supplies and other goods subject to fluctuations in market prices.

High Yield.—It may be contended that experience in recent years has been abnormal and that public utilities in earlier and more normal periods have not shown similar advantages. A comparative study made about ten years ago clearly shows that this is not the case. Henry L. Doherty, a pioneer in the public utility field, then undertook a study of the history of public utility and other corporations covering a period of thirty years, involving all steam railroads in the United States, all industrials large enough to be reported in financial publications, and all gas and electric companies for which statistics could be secured. The total capital involved in this study was over $545,000,000,000. Of this over $9,500,000,000 was found to be involved in insolvencies. The average annual amount of securities in receiver's hands per $100 of par value in different classes of business was found to be as follows:

Industrials	$2.07
Railroads	1.84
Gas and electric companies	0.37
National banks	0.32

The average net earnings of the first three of these groups were found to be as follows, in percentages of outstanding securities:

	Per Cent
Railroads	4.25
Industrials	7.79
Gas and electric companies	8.45

A further study covering the ten-year period preceding the inquiry showed that the fluctuation in net earnings of gas and electric companies had been smaller than that of the others, being

a fraction of 1 per cent, railroads coming next with a slightly greater fluctuation but still within 1 per cent, and industrials showing a much wider range, amounting to nearly 5 per cent. During the period analyzed gas and electric companies showed a greater increase and expansion of business and capital than the other classes, this increase in percentage being double that of railroads and about seven times that of industrials. The above data, covering a period of years which included a wide range of business activities, and involving a very wide scope of operations, are worthy of acceptance and have been quoted with approval by many statistical and utility authorities.

Safety.—A recent booklet distributed by the Savings System of the United States Treasury Department lists among bonds which are recommended as safe investments those of the United States, states, county and municipal divisions, railroads, public utility corporations, such as gas and electric companies, and corporations engaged in private industry. To the extent that the order in which the above bonds are listed is significant—and apparently it is intended to be so—public utility bonds rank with railroad bonds next to obligations of the government and its political subdivisions and ahead of those of other private corporations.

This official view of the standing of public utility bonds is confirmed by the Investment Bankers Association, and by officials of Moody, Forbes, and other financial and rating organizations, and by insurance companies in various published statements.[1] Harvard University, which has handled its large endowments with exceptional skill, has 26 per cent of all its funds in public utility securities.

Stability of Return.—Regularity of return has been referred to above and in Chap. II and needs no further comment other than to point out that stability of income is preferred by the average investor to income which may be exceptionally high at times and small or wholly absent at other times, even if the average is slightly higher.

The marketability of public utility securities is subject to some limitations, although the list of those quoted on stock

[1] Report of Committee on Public Service Securities, Investment Bankers Association of America, 1923; Moody's *Investors Service*, Feb. 8, 1923; *Forbes*, Jan. 15, 1925, p. 461; Report, Connecticut General Life Insurance Co., 1924.

exchanges is constantly increasing and includes practically all large public utilities throughout the country and many comparatively small ones. A considerable number of unlisted securities can be bought and sold without difficulty through investment banking houses, and so an investor can trade in public utility issues with reasonable and constantly increasing ease.

The taxes assessed upon public utility securities in the hands of investors, or their income, do not differ from those applying to other enterprises, nor is the practice of public utilities in assuming income taxes on their obligations for their investors different from that found elsewhere.

SIGNIFICANT GENERAL FINANCIAL RELATIONS

The factors so far considered are general and may not have application to all public utilities. In a specific study of any particular situation the bearing of each of the factors discussed and others that may present themselves should be given attention. It has been pointed out that public utilities have an unusually high investment as compared with revenues, and correspondingly high provisions for interest, dividends, and retirements. These charges usually amount to not less than one-third and may be as high as three-fourths of the earnings of the property, depending upon its character. It is obvious that such a wide range of fixed disbursements requires a complementary range in operating expenses and other factors entering into the cost of service. The possibility of a general rule covering these relations suggests itself, and such a rule has been developed. This rule, although approximate and subject to some reservations, is believed to embody in simple form the fundamentals of the financial structure of public utilities. It is used, as will appear, in the further analysis of security issues which follows.

Definition of Terms.—Before proceeding to a statement of this basic rule, however, it is necessary clearly to define the terms which appear in it. In the early days of public utility activities accounting methods were comparatively simple. The operations of the utilities were expressed in terms of gross earnings, operating expenses and taxes, net earnings, and net profit. Modern accounting methods have added many refinements to these simple terms.

Revenues or Earnings.—The term "earnings" has been replaced by "revenues," and revenues are divided between operating and non-operating functions. Operating expenses and taxes are similarly divided, and returns from leased or investment property are sometimes excluded from revenue accounts. For the purposes of this particular chapter it is necessary to revert to the older and simpler forms of accounting which are still found in many of the published financial statements using the term "gross earnings" (sometimes referred to as "earnings" or "gross") to include all revenues whether from operating or non-operating property or from investments. Where investments and their income are large it may be preferable to exclude both from operating statements such as are considered herein.

Expenses.—Operating expenses, in turn, include all expenses and maintenance involved in securing the earnings above defined. Operating expenses as defined do not include provisions for retirements, sometimes called "depreciation." Taxes are commonly associated with operating expenses in financial statements and ordinarily include all property and income taxes.

Accounting systems which have been developed in some jurisdictions include provisions for depreciation in operating expenses. The uniform system of accounts adopted in 1922 by the National Association of Railway and Utilities Commissioners, and already prescribed by more than half the state commissions which supervise accounting, removes any requirement for including retirement charges in operating expenses, leaving it optional with the utilities to make appropriations therefor from surplus if desired. Operating expenses, as discussed herein, do not, therefore, include any provisions for retirements but do include current maintenance. The balance remaining after operating expenses have been deducted from gross earnings is called "net earnings" in this discussion.

Operating Ratio.—The term "operating ratio" is very commonly used by public utilities as an index to efficiency or character of operations. It is the ratio of operating expenses to gross earnings. By special definition it may be made to include taxes or retirement provisions, or both, with operating expenses. As used herein it will, unless otherwise stated, include operating expenses and taxes but not provision for retirements.

Investment.—The term "investment" is used to represent the value of the property for rate-making purposes or the "rate

base," as it is sometimes called. It does not necessarily mean the amount of money which investors have paid for securities that the utility has marketed, nor this amount plus surplus earnings belonging to investors which have not been distributed, nor such total increased by invested reserves. Neither is it represented by the cost of reproduction at prevailing or average prices. It is intended to be the value which a regulatory commission should assign to the property used and useful in the service from which earnings are derived and in connection with which expenses and other charges are incurred.

Interrelation of Investment Ratio and Operating Ratio.—With these definitions in mind the basic rule under consideration connecting investment and operating ratios may now be stated. Inasmuch as the investment is fixed and the operating ratio is subject to some degree of control, the natural inquiry is as to whether the current operating ratio is a proper one. For this reason the rule will be stated as a test of the correctness of the operating ratio, as follows: *The operating ratio, expressed as a per cent, should not be greater than* 100 *minus* 10 *times the ratio of investment to earnings.* This rule in its limiting form may be expressed as a formula as follows:

$$R = 100 - 10\,\frac{I}{E}.$$

By transposition and rearrangement this formula may take the following alternative forms:

$$100 - R = 10\,\frac{I}{E} \quad \text{or} \quad \frac{I}{E} = \frac{100 - R}{10} \quad \text{or} \quad \frac{I}{E} = 10 - \frac{R}{10}.$$

This formula in its several forms expresses relations which are well known to utility executives. In one form it amounts to the statement that the balance remaining of each dollar of earnings, after paying operating expenses and taxes, must be equal to 10 per cent on the investment made for each dollar of earnings; in another form, that the dollars of investment for each dollar of earnings must be equal to one-tenth of the difference between 100 and the operating ratio. A few illustrations will serve to fix the application of the formula in its original form:

A property having an investment of \$400,000 and gross of \$100,000 should have an operating ratio not exceeding 60 per cent, for

$$60 = 100 - 10\,\frac{400{,}000}{100{,}000}.$$

If the investment is \$5 per dollar of gross, the operating ratio must be 50. An expensive hydroelectric development with \$7.50 of investment per dollar of gross must operate at a 25 per cent ratio. These illustrations may suggest a still simpler statement of the rule, namely, that the investment per dollar of gross must equal the difference between the 10 and the operating ratio on a scale of 10 instead of 100.

What the above rule intends to do is to allow 10 per cent on the investment for interest, dividends, and provisions for retirements. This is not a liberal allowance, which accounts for the first statement, *i.e.*, that the operating ratio must not exceed the percentage so determined. It is the very general practice of commissions to allow 8 per cent return to investors, which leaves, of the 10 per cent total, only 2 per cent for retirements. This is smaller than the usual allowance, but it is intended to provide only for average retirement costs and not to accumulate a reserve equal to the so-called accrued depreciation existing in the property.

The differences between these two provisions, for retirements and depreciation respectively, and a further discussion of accounting methods relating thereto are contained in preceding chapters. If retirements charges instead of taxes were included with operating expenses in the operating ratio, taxes being associated with return, the formula under consideration would be slightly more accurate.

Where provisions for retirements are definitely fixed as a percentage of investment, and taxes are similarly known, these two factors may be combined with the percentage of return to investors, assumed or fixed by the commission, the total of these percentages being represented by F, and the basic formula may be changed into the following form, in which the operating ratio provides for operating expenses only:

$$R = 100 - F\frac{I}{E}.$$

This is, again, but another way of expressing the obvious fact that the average dollar of earnings must provide for its proportion of necessary operating expenses, taxes, retirements, and return to investors.

Application of Rule.—The general application of the relations above defined may be shown by illustrations of several assumed

utility properties, each having gross earnings of $100,000 and capitalization in different amounts, but in all cases with 60 per cent of the total in bonds, 15 per cent preferred stock, and 25 per cent common stock, all sold at par and yielding 6, 8, and 10 per cent, respectively. The expenditures for expenses and taxes in the several assumed capitalizations are fixed in accordance with the above formula. In the three illustrations shown, the investments are $4, $5, and $8, respectively, per dollar of gross, and the expenses and taxes are, respectively, $60,000, $50,000, and $20,000. The following table shows the disposition of earnings, varying in the different cases, but all yielding a final balance amounting to the same percentage of the investment.

Investment	$400,000	$500,000	$800,000
Earnings	100,000	100,000	100,000
Expenses and taxes	60,000	50,000	20,000
Net earnings	$ 40,000	$ 50,000	$ 80,000
Interest	14,400	18,000	28,800
Balance	$ 25,600	$ 32,000	$ 51,200
Preferred dividends	4,800	6,000	9,600
Balance	$ 20,800	$ 26,000	$ 41,600
Common dividends	10,000	12,500	20,000
Balance for retirements and surplus (2.7 per cent)	$ 10,800	$ 13,500	$ 21,600

If a normal property does not have an operating ratio conforming reasonably well with the requirements of the formula given above, it is lacking in some of the desirable elements making for the stability of the property as a whole. This does not mean that, in the absence of such conformity, it may not continue to operate or that its bonds, or even preferred stock, if in moderate amounts, may not be a safe investment. When it comes to special classes of property, such as large hydroelectric developments, some modifications in the general rule must be recognized or, as an alternative, the last special form of the formula involving the F factor must be used.

A large hydroelectric system having an investment of $8 per dollar of earnings will probably not have an operating ratio,

including taxes, quite so low as 20 per cent. In such cases the taxes, applying largely to property remote from developed areas, will be comparatively small and the appropriations needed for retirements will also be a small percentage of the investment because of the particularly stable character of the property. If 2 per cent is sufficient for both taxes and retirements, then the operating ratio, including expenses only, may be 20 per cent, which will meet the demonstrated needs of large properties. Many such properties have been unable to meet the test of this formula in early years because full utilization of the investment could not be secured initially but required gradual development. This has meant temporary sacrifice in return to investors or in provisions for retirements or both.

The railway group may be used as a further illustration of the application of the rule. It has, as a whole, an investment of more than $5 per dollar of earnings. Its operating ratio should, therefore, not be higher than 50 per cent. In fact, the actual ratio is above 70 per cent, and the comparatively unprofitable status of the industry is well known. Strenuous efforts have already been made to improve this operating ratio by reductions in expenses. Further gain must come through increases in revenue either by raising fares, which are still below the levels prevailing in other comparable industries, or by increasing traffic through more aggressive competition with other forms of transportation, or otherwise.

The statement of this basic rule connecting investment and operation in so many different ways, and the various illustrations of its application have been deliberately undertaken because it is believed to be a particularly useful yardstick, although only an approximate one. It is hoped that some one of the forms in which it is presented will appeal to the reader and be retained.

TESTS OF PARTICULAR CLASSES OF SECURITIES

The foregoing discussion offers only a general test of the stability and successful operation of a utility property without regard to the details of its financial structure. An investor, while interested in a general way in these matters, is more particularly concerned with the attractiveness of a particular issue of bonds or of preferred or common stock, and he seeks some fairly simple rules for determining whether or not the securities

in question are suitable investments for his funds. Such rules or tests are commonly applied to bond issues but are less clearly developed for junior securities. These various tests will now be discussed and their advantages and shortcomings indicated.

BONDS

Financial circulars in which bonds are advertised commonly attempt to measure the attractiveness of the bonds by the ratio of net earnings to interest requirements. Where interest is earned two or more times, the assumption seems to be that the bonds are a safe investment; even one and one-half times is sometimes considered satisfactory. A brief examination of certain illustrative situations will show that such a rule is not wholly safe. Assume, for example, a property having an investment of $4 per dollar of gross, 50 per cent of the investment consisting of 5 per cent bonds.

The bond interest in this case will require only 10 per cent of the earnings ($4 \times 0.50 \times 0.05$), and if this interest were earned only one and one-half times, the margin after interest would be only 5 per cent of the gross and might be more than wiped out by business reverses of no unusual magnitude. With 60 per cent of the investment in 6 per cent bonds, 14.4 per cent of earnings would be required for bond interest and a decrease of 7.2 per cent in the earnings would wipe out a 50 per cent margin over the bond interest. If this interest were earned two times, there would be a margin of 14.4 per cent for protection.

It has been stated above that public utility revenues and income are unusually stable. This does not mean, however, that individual companies may not be subject to substantial temporary losses. A study of a large group of companies over an extended period of years indicates that a normal utility may show a loss in earnings, as compared with the preceding year, in about one year out of ten. The records studied include the World War period, in the early years of which jitney competition played havoc with many companies, and so a more normal period should show much less tendency to a loss.

It is, nevertheless, true that supposedly stable public utilities have shown losses in earnings approaching 20 per cent in single years, and cumulative losses materially in excess of 20 per cent under circumstances which may possibly be duplicated in the future. Such losses can be offset only in part by reductions in

expenses, and railways which have shown the greatest losses are less able than other utilities to curtail costs of service. Although losses of such magnitude are not to be expected as a matter of course, they should be provided for by a financial structure which will avoid danger of receiverships.

General Bond Rule.—This leads to the recommendation of a more logical rule for the safety of bond interest and principal, stated as follows: *The margin after payment of interest, but before provision for dividends, retirements, or surplus, should be not less than* 20 *per cent of the earnings.* A study of income statements of a wide range of public utility companies shows that well-established companies ordinarily show a margin greater than the stated 20 per cent after all interest charges have been met. During the war period and the subsequent depression an appreciable number of large and stable companies failed to meet this test, but the then existing combination of adverse circumstances, including unutilized investment, losses in revenue, and inflated expenses, will probably not occur again. Even then, with few exceptions, these companies avoided financial difficulties by curtailment of dividends or use of accumulated surplus.

It is interesting to note that the narrower margins of earnings after bond interest are normally found in companies with low capitalization but high proportion of such capitalization in bonds. For a company with $4 of investment per dollar of earnings and an operating ratio of 60 per cent, an issue of 6 per cent bonds amounting to 75 per cent of the total capitalization would show a margin of 22 per cent of the earnings after interest. If such bonds made up only 50 per cent of the capitalization, the margin over interest would be 28 per cent. If the bonds bore 5 per cent interest, the margins in the two cases would be 25 and 30 per cent, respectively. With the investment increased to $5 per dollar of gross and the operating ratio correspondingly reduced to 50 per cent, 6 per cent bonds constituting 75 and 50 per cent respectively of the investment would show margins of 27.5 and 35.0 per cent, respectively, after interest. These figures show the range of margins ordinarily to be expected from normal properties when the prescribed test conditions have been met.

Ratio of Bond Issue to Net Earnings.—Conservative investors may not be wholly satisfied with the tests above described, which are similar in general character, and may seek other pertinent but different factors. For this reason a rule which

takes into consideration the size of the bond issue itself in relation to net earnings may be helpful. In developing this rule reference is made to the basic formula first stated connecting operating ratio with investment ratio. It will be recalled that the operating ratio (R) was related to investment (I) and earnings (E) as shown in the following formula:

$$R = 100 - 10\frac{I}{E}.$$

It will now be assumed that the bond issue is represented by a certain proportion (P), a decimal, of the investment, and that the net earnings are represented by the expression $E\left(1 - \frac{R}{100}\right)$. The ratio (represented by X) of bond issue to net earnings is shown in the following equation:

$$IP = E\left(1 - \frac{R}{100}\right)X.$$

If the value of R in the basic formula above stated is substituted in this equation, it takes the following form:

$$IP = E\left(1 - \frac{100 - 10\frac{I}{E}}{100}\right)X.$$

Simplifying this equation, it is found that I and E disappear, leaving the following very simple relation: $X = 10P$. Remembering that P is a decimal, this equation may be paraphrased as follows: *The ratio of bond issue to net earnings equals the ratio of bonds to total capitalization expressed in tenths.* For example, if bonds constitute 60 per cent, or six-tenths, of the capitalization, they may also be six times net earnings. It follows from the derivation of the rule that this is consistent with the original assumption that net earnings, including provision for return to investors and retirements, should be not less than 10 per cent of the investment.

Certain published statements of net earnings are to be found which have included provisions for retirements in operating expenses. The ratio above stated does not, of course, apply under these circumstances, but it may be modified through a revision of the basic formula defining operating ratio, including both taxes and retirements, into the form $R = 100 - 8\frac{I}{E}$. Substituting such revised value of R, the formula connecting

bond issue and net earnings becomes $X = 12\frac{1}{2}P$. In the 60 per cent bond issue illustrated above, where it was found that the amount of the issue might be six times net earnings, it appears that, if retirements have already been taken care of before arriving at net earnings, the bond issue may be seven and one-half times such net earnings.

It is obvious that such a rule as this is not of universal application, for it places no limit upon the proportion of capitalization which may be in bonds. For example, a general application of the rule would indicate that it would be safe to issue bonds up to even 90 per cent of the total capitalization, these bonds amounting to nine times the net earnings. As a matter of fact, no public utility would be found where this relation would exist under normal conditions, and the margin of earnings remaining after interest charges would be too small for safety and inconsistent with the ratio already set up. If, for conservative investments, the rule is adopted that bonds should not exceed 60 per cent of the total investment, then the test may be applied that the bonds shall not exceed six times the net earnings before providing for retirements, or seven and one-half times net earnings after such provision.

An examination of financial statements of a wide range of public utility properties shows that, in general, the well-known stable properties meet this rule, although exceptions will be found which indicate that it should not be applied too rigidly. In fact, all the rules here stated for tests of bond investments should be considered as a general guide for conservative investors, and margins in at least some of them may safely be allowed by other investors.

Summary of Rules.—To summarize the three rules herein stated, namely: first, that net earnings should be double interest requirements; second, that the balance after interest requirements should be at least 20 per cent of the gross; and, third, that the bond issue should not exceed 6 times net earnings before retirements or $7\frac{1}{2}$ times net earnings after retirements—it may be stated that the first rule, while most commonly used, is least reliable; that the second is ordinarily to be depended upon and is easy of application because it involves readily available figures; and that the third is useful as a check but should not be applied too rigidly if the other tests show a suitable margin and general conditions are favorable for stability.

Holding Companies.—Before passing to the consideration of other classes of securities, certain limitations to the applicability of the above tests of bond issues should be stated. What has been heretofore said applies to bonds secured by mortgages on physical property of operating utilities. It is the practice of holding company organizations, which, as already pointed out, exercise a wide range of control over operating companies, to issue their bonds having as their principal security the junior issues of the operating companies. The bonds of the holding company, being based upon the equity of operating companies, have not the same security or stability as mortgage bonds.

This may be illustrated by an operating company having an investment of \$1,000,000, consisting of \$700,000 of bonds held by the public and \$300,000 of stock owned by a holding company, gross earnings of \$250,000, and net earnings of \$100,000. The holding company, in turn, issues \$200,000 of bonds and \$100,000 of stock, all in the hands of the public. The operating company, after providing for interest charges and reserves, has a balance of \$33,000, constituting the income of the holding company. The bonds of the holding company require \$12,000, this interest being earned 2¾ times, which might superficially be considered a safe margin, but, as a matter of fact, the \$21,000 balance of the holding company after interest is only 8.4 per cent of the gross earnings of the operating company, which is the sole source of revenue.

Business reverses or price fluctuations might easily decrease the earnings or increase the expenses of the operating company by this amount, leaving the holding company bondholders without protection and the stockholders with neither income nor value to their equity. Although the stockholders' equity in the holding company appears to be one-third, as a matter of fact it must be considered in connection with the equity of the operating company, which is three-tenths; so the real equity of the holding company stockholder is only three-tenths of one-third, or one-tenth. It follows from the above that the investor in holding company securities must give special attention to the property on which they are issued and the final source of earnings from which the return is paid.

The statements published by holding companies often fail to give the information necessary for analyses such as are here proposed, and the Investment Bankers Association is taking

steps to bring about a correction of this defect for the better protection of investors.

Underlying Issues.—The foregoing discussion has assumed that one bond issue only was outstanding in the typical properties used as illustrations. This is not commonly the case with existing companies, particularly larger ones which, through consolidations, reorganizations, and growth, may have a considerable number of issues. The character of these issues has already been discussed in the chapter on Capitalization. Bonds sold by the companies themselves from time to time are usually parts of the latest authorized issues which yield priority to underlying issues. The reasoning and tests heretofore stated are, therefore, directly applicable to these issues, their interest payments being the final ones and requiring the margins and ratios stated.

Bonds of underlying issues are, however, commonly found on the investment market, although not advertised in the same manner as current issues, and the investor, in determining their attractiveness, may apply somewhat different tests on the assumption that for each issue interest payments and rights to the property have priorities over succeeding issues. This is not always the case, and where receivership exists the question of relative rights of creditors is one for the decision of the court. In general, however, the rights of underlying issues take precedence over succeeding ones. An investor, therefore, may, for a first mortgage, determine the ratio of the interest requirements of that particular issue to the net earnings available therefor and to gross earnings, etc., as herein outlined.

In a succeeding mortgage, with other issues following it, the interest requirements may similarly be compared with the net earnings less such interest payments as have priority. When a number of consolidations, as well as reorganizations, have taken place, the question of priorities may become very complicated and the average investor, in the absence of authoritative information and perhaps legal advice, may well adhere to the rules originally set up applicable to interest payments as a whole, making approximate allowances for such priorities in any particular issue as are clearly justified.

Laws Governing Bank Investments.—Before leaving this subject, it will be of interest to review briefly the provisions, already referred to, of the laws of various states with reference to

investment in public utility bonds by savings banks and similar institutions. Not less than twelve states have specifically defined the characteristics fixing the eligibility of such securities. Although it is not necessary to review all these laws in detail, a brief summary of their outstanding features will throw some helpful further light upon the tests above indicated.

Several states require that the par value of indebtedness shall not exceed that of outstanding stock, and that such stock must have paid from 4 to 5 per cent dividends continuously for a period of years, usually from three to five. Some, but not all, of these states require that the dividends shall have been earned as well as paid. From a bondholder's point of view it is the earning of the dividend rather than its payment that is significant, the disbursement detracting from rather than adding to his security particularly if provision for upkeep of the property has been scant. In a few cases this requirement is supplemented by the further stipulation that net earnings shall be at least double interest requirements. In one case only (California, 1923) the interest must be earned only one and one-half times for a period of only one year. This is an unusually low limit. In two other states (New Hampshire and Vermont) the net earnings must be one and three-fourths times the interest requirements for a period of three years for utilities having net earnings of at least $500,000, the ratio increasing to 2 if the net earnings are $250,000.

It is usually stipulated that the bonds must mature several years before the expiration of essential franchises, or that the franchises shall be of the indeterminate form. Connecticut (1923) has such a limitation, with the further provision that certain public utilities must be incorporated in that state and be free from direct competition, and that not more than 2 per cent of a bank's assets may be invested in any one such security. A few states require that bonds shall not be eligible unless the issuing utility is subject to regulation by a state commission (New Hampshire, 1921), and the commission has approved the issue in question (Michigan, 1923).

It appears that the eligibility provisions as above outlined are not wholly consistent with those previously stated herein, in one or two cases being less exacting and in others somewhat more so, including limitations as to the volume of business and also its character. Some of the restrictions have little necessary

relation to investment safeguards, but, as a whole, they may aid in distinguishing conservative investments from those involving risks which many investors are not justified in assuming.

Effect of Net Earning Ratio upon Yield.—Other investors who are attracted by the higher yield which less stable bond issues offer may be interested in a study of the variation in yield with change in stability, as measured by the ratio of net earnings to bond interest. This, as already indicated, is not the best test of desirability, but it will serve reasonably well for this particular

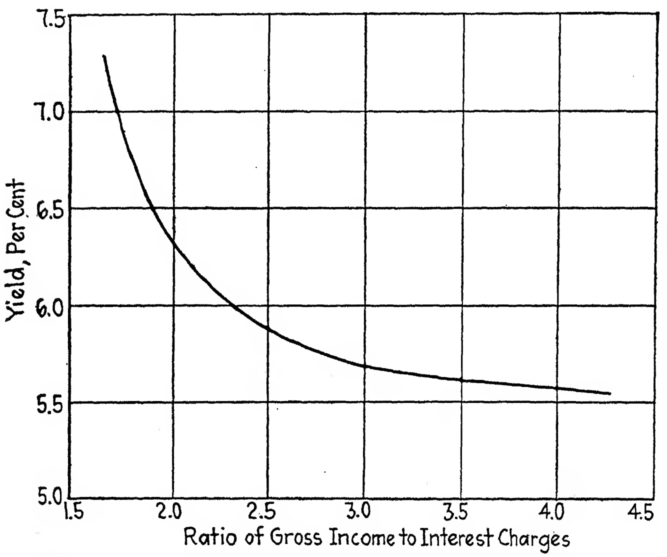

FIG. 7.—Effect upon yield of changes in ratio of gross income to interest charges.

inquiry, it being the one set up in most of the financial advertising from which the data are taken. An accompanying curve (Fig. 7) shows the yield from bonds with a wide range of net earning ratios. The curve represents the widely advertised offerings of utility bonds for a period of a year ending early in 1923. This period was one of fluctuating interest rates, but a careful chronological study of the data showed no disturbing trend. At some other period this curve might be higher or lower as a whole, but its slope should not be materially changed.

It will be noted that the curve shows a comparatively stable yield when interest is earned more than 2½ to 3 times, but that

it increases between 2½ and 2 times, and reaches a prohibitive rate, from the borrower's point of view, before the 1½ ratio is reached. This is all confirmatory of the standards set up herein. The many individual points on which the curve is based, which, to avoid confusion, are not reproduced, include some substantial departures from the average, due to special local conditions, and these have been given such weight as these conditions seemed to justify.

Stocks

It has been seen that the security of investments in and return on utility bonds may be approximately tested by the application of certain general rules, but that any such rules are not infallible, discrimination in their use being necessary. The safety of principal and stability of return of junior securities is still less susceptible to definite test. The conditions surrounding junior securities are quite different from those applying to bond issues in that dividends are not guaranteed and there can be no default or foreclosure in the absence of dividends. It is true that certain preferred stocks have an obligation to pay up dividends that have been passed before any dividends are paid on subsidiary issues, but no further obligation exists.

Preferred Stocks.—Considering first the question of preferred stocks, there appears to be no rule now in general use for testing their desirability as an investment other than one similar to that generally applied to bonds, *i.e.*, the ratio of net income (balance after interest) to preferred dividend requirements or, in other words, the number of times the dividend is earned. An examination of the financial statements of public utilities shows a much wider range in this ratio than with bond interest. The advertised offerings of utility preferred stocks during the past two years show a small percentage in which the net income has not been at least twice the dividend requirements, and a number of cases where the ratio is several times as large. The average ratio of the offerings was not far below 4 times, but it, of course, does not follow that this represents the average for all operating utilities because, when the margin above dividends is small, the stock will not be offered because of known lack of market.

The same sort of reasoning which was developed for bond issues applies with increasing force to preferred stock. Therefore, comparatively little reliance may be placed upon this test

of desirability even when the ratio is well above that which is the conventional limit for bonds.

The safer test of preferred stocks involves the relation of the balance, after preferred dividends, to gross earnings, and the relation of the outstanding issue as compared with the common stock which follows. In order to make preferred stock attractive with stable dividend payments, the issue should be small as compared with the common stock which follows, and the balance of income after preferred dividends should be sufficient to provide for common dividends, retirements, and surplus, being not less than 15 per cent of the earnings. The preferred issues should ordinarily not be more than half the common stock issue and not more than 15 to 20 per cent of the total outstanding capitalization where bonds are outstanding in normal amounts. Where bonds amount to materially less than 50 per cent of the total capitalization, the suggested ratios tend to lose their significance. This assumes that the common stock represents value in the property, physical or non-physical, which is not always the case with the older unregulated properties.

The requirements of preferred stock dividends with relation to other items in the income statement of a typical public utility are illustrated in the following table, in which the assumed investment is $1,000,000 and the gross earnings $250,000. This utility, with an operating ratio of 60 per cent, has net earnings of $100,000, the disposition of which is shown in the table.

		Times earned	Per cent of gross earnings
Net earnings	$100,000	...	40
Bond interest (6 per cent on $550,000)	33,000	3.3	13
Balance	$ 67,000	...	27
Preferred dividends (8 per cent on $150,000)	12,000	5.6	5
Balance	$ 55,000	...	22
Common dividends (10 per cent on $300,000)	30,000	1.8	12
Balance for retirements and surplus	$ 25,000	...	10

Assuming now that this utility has been subjected to unfavorable conditions with its operating ratio increased to 70 per cent, and has found it necessary to raise 75 per cent instead of the 55 per cent of its capitalization in bonds, the balance being 10 per cent in preferred and 15 per cent in common, the showing would be as follows:

		Times earned	Per cent of gross earnings
Net earnings	$75,000	....	30
Bond interest	45,000	1.67	18
Balance	$30,000	....	12
Preferred dividends	8,000	3.75	3
Balance for common dividends, retirements, and surplus	$22,000	....	9

In this case preferred dividends were earned 3¾ times, which might be superficially considered a satisfactory margin. As a matter of fact, however, the balance after preferred dividends is less than 10 per cent of the gross, and is a scant provision for retirements, with no allowance for common dividends or surplus. The situation, therefore, is not a healthy one, in spite of the apparent margin after preferred dividends. The normal showing of the company in the first table embodies the conditions which give liberal protection to the preferred stockholder. Although it is desirable for the investor to make some such analysis as that given above in connection with preferred stock investments, some more specific rules are desirable if they can be developed.

Preferred Stock Rules.—In view of the unreliability of a rule involving the number of times preferred dividends are earned, it is advisable to restrict its use to rough checking purposes and to normal capitalization only. A rule that the balance after preferred dividends should be not less than 15 per cent of the annual revenues insures a fairly safe margin, consistent with the 20 per cent margin embodied in a preceding bond rule.

Similarity exists to a certain extent between bonds and preferred stock in that they both have priorities over the equity in

liquidation, and their normal rates of return are fixed. This similarity suggests the possibility of establishing tests involving a combination of interest and preferred dividends. Such a test would also be applicable to cases where the conventional form of capitalization is not employed. It has been seen that bond interest should be earned about 2 times for secure investment. A like rule for the combination of interest and dividends should, for equal security, provide net earnings from 1½ to 1⅔ times the requirements.

Still another combined test may be made relating the total of bond and preferred stock issues to net earnings. In preceding pages, in deriving such a rule applicable to bonds only, it is found that the ratio of the issue to net earnings should be equal to the ratio of the issue to total capitalization expressed in tenths, the formula being as follows:

$$X = 10P,$$

X being the ratio of bonds to net and P (a decimal) being the ratio of bonds to total capitalization. This same formula may be applied to the combination of bonds and preferred stock; in fact, it is applicable to capitalization as a whole. It should be pointed out, however, in connection with any restricted application such as that here proposed, that no distinction is made in rate of return applicable to different classes of securities. For present purposes it is permissible to assume that the average rate is earned for, although not necessarily distributed to, holders of bonds and preferred stock.

Applying the above formula, it appears that the combined issue of bonds and preferred stock for a normal capital structure may be about 7½ times net earnings but varying, as in the case of bonds, with the distribution of capital and with limitations (as before stated) to the application of the rule for unusually large percentages of combined issue. If retirement provisions have been included in operating expenses, and net earnings are correspondingly reduced, the combined issue of bonds and preferred stock may be 9 times the net earnings. The above ratios are comparable with 6 and 7½ times, found for bond issues alone before and after providing for retirements. As with bonds, the possibilities of decreases in revenues or incraases in expenses should be studied from a series of annual statements or from a consideration of the character of the business and the territory served.

Where both revenues and expenses are of proved stability, the required margin over requirements for interest or dividends may be reduced from that needed for less stable situations.

Common Stocks.—The determination of the desirability of utility common stocks as investments is not readily subject to rules such as have been stated herein for bonds and preferred stocks. Common stock represents the final equity in the property and rights to distributable earnings. A utility subject to fluctuations in earnings or expenses will show a much greater proportional fluctuation in balance available for common dividends, and the records of common dividend disbursements naturally show much greater fluctuations than in returns to any other investors. With utilities making appropriations for retirements from surplus, the balance remaining after common dividends is needed for retirements, contingencies, stabilization, and credit. Experience has shown that in a normal utility such balance should average about 10 per cent of the revenues.

The balance available for common dividends will, therefore, be the amount remaining after preferred dividends, less 10 per cent of the gross. The income statement of a normal public utility, shown in connection with the discussion of preferred dividends, shows a balance after common dividends of 10 per cent of the gross, a balance before common dividends of 22 per cent of the gross, and 1.8 times the common dividend requirements. The less favorable illustrative income statement which followed showed a balance after preferred dividends amounting to less than 10 per cent of the gross, with, therefore, nothing actually earned for common dividends.

It appears, in the light of the above general statements, that any prospective investor in the common stock of a utility may best judge its attractiveness by a study of the financial history of the company for a considerable period of years, particularly the balances available for common dividends and the extent of their fluctuations. In many cases it will be found that, although earnings have been unstable and the dividend distribution irregular, the average earnings applicable to the common stock have been sufficient to justify investment if regularity of return is unimportant.

Referring again to the income statement of a normal utility, it appears that an increase of only 12 per cent in earnings without change in operating costs, or an equivalent decrease in expenses

would double the balance distributable for common dividends, making it 20 per cent on the outstanding stock instead of 10 per cent. For this reason, such issues have possibilities of both large and scant earnings which an investor must take into consideration in the light of his requirements before using his funds therefor instead of for the more stable but lower yield alternatives. It is, nevertheless, true that the comparative stability of utility revenues tends to give their common stocks a rating as investments as distinct from the speculative character of many other common issues.

SOURCES OF ANALYTICAL INFORMATION

An analysis of public utility investments such as the foregoing discussion has outlined requires a considerable volume and range of information. The investor who makes his own investigations of particular properties should secure as much as possible of this information, which is here summarized for convenience:

Annual Reports.—First in importance is an income statement of the property. This should be available in reasonably complete form for several years, showing separately gross earnings, operating expenses and taxes, net earnings, interest requirements, net income, dividends of different classes, and surplus. In addition to the above, a summary statement showing gross earnings, net earnings, and net income is desirable for a longer period of years, at least for property subject to business fluctuations. These statements should indicate clearly whether retirements have been fully provided for in operating expenses or are to be deducted from surplus. In financial advertising the income statement is often supplemented by a statement of interest or dividend requirements after giving effect to the new offering. It is desirable to have a statement of the total outstanding capitalization by classes of securities, and also the rate base if it has been fixed by a regulatory commission.

A statement of the value of the property as determined by appraisal engineers, however reputable, should not be given too serious attention unless it has been officially confirmed, at least if such valuation is based upon prevailing prices, as is commonly the case. In the absence of any authoritative finding of value, the investigator who wishes to apply the operating-ratio rule herein developed will be forced to base his judgment as to a

suitable rate base upon book value shown in the balance sheet, with such deductions, if any, as may be appropriate in the light of existing regulatory restrictions upon capitalization and the length of time they have existed. In some cases, unfortunately, no definite relation can be established between book value and fair value. Data given in a later chapter may be of assistance in making or checking estimates of fair value.

The latest available condensed balance sheet of the company is also very important, particularly for its showing of accumulated reserves for retirements and surplus, these two items having a definite bearing upon the stability of the company. A list of officers and directors, particularly the latter, will interest an investor who is acquainted with prominent public utility executives and financiers, as showing the backing and affiliations of the company. It is needless to say that full information should be available with respect to any particular issue of securities offered, including its relation to outstanding issues, tax exemption features, and any pertinent restrictions embodied 'n mortgages and important franchises.

Much of the information described above is not readily available to the independent investor and is not disclosed in ordinary financial advertising of new issues or the financial circulars which are coincidentally issued for the further information of investors. The annual reports of the operating utilities usually contain the needed information with respect to the year to which they apply. This is not yet the case with many holding companies, and further information should be secured regarding their operations and those of their subsidiaries.

Investment Manuals.—A popular source of information for investors in public utilities is Poor's "Manual of Public Utilities" (now combined with Moody's "Manual"), which is issued about the middle of each year and contains information up to the close of the previous year. The annual issue is supplemented by periodical publications of current income statements and other data, and a more comprehensive quarterly cumulative digest, through which investors may keep posted on current developments. The "Manual," which is available in banks, libraries, etc., contains concise yet comprehensive information regarding corporate history, franchises, character of property, valuation where established by commission, capitalization, the characteristics of various security issues, income statements for

a period of years, condensed balance sheet, and lists of officers and directors. Recent issues of the "Manual" also show the number of times which interest, and in some cases dividends, have been earned.

John Moody's "Rating Book," issued annually, is also commonly used by investors and others seeking financial and statistical information. It contains, in addition to the usual information, analyses of income and other interesting data, including a so-called "factor of safety" not found in other publications. The "Fitch Bond Book," issued annually, also contains in condensed form essential information regarding bond issues, including the original offering price and yield, and subsequent ranges. Further information, bearing more particularly on the physical property characteristics, is to be found in the McGraw directories of central stations and electric railways (issued annually and semiannually, respectively), and Brown's "Directory of American Gas Companies" (published annually).

Commission Reports.—The annual reports of public utilities to state commissions, the files of which are accessible to the public, and the annual reports of the commissions, containing summaries of these reports, are also useful for the periods which they cover. The volumes of "Public Utilities Reports," which include all important decisions of commissions and courts affecting public utilities from 1915 to date, contain much information regarding valuations and operating conditions and the policies of the regulatory authorities that is helpful in connection with very thorough investigations. The weekly issues of the *Commercial and Financial Chronicle* (New York) contain news of all important financing, corporate developments, and, from time to time, income statements—all of which are carefully indexed in successive volumes.

Other Considerations.—To the extent that the above sources of information are accessible to students of investment conditions sufficient data respecting the suitability of investment offerings can usually be obtained and the tests herein outlined applied. Many factors bearing upon general investment conditions and policies have not been mentioned because space cannot be given for their adequate discussion. They include business and production forecasts and analyses of cyclical movements of prices and money rates, which have a very important bearing upon the satisfactory disposition of investment funds.

A further important factor in public utility investments has also been omitted. Most such properties are growing rapidly, and many have not yet reached what may be called maturity. The fact that past showings have been unsatisfactory should not imply that a much more profitable future is improbable. Many investors have purchased junior securities of such properties without expectation of immediate return but with assurance that future developments will not only permit adequate returns but also bring about a substantial increase in the market value of the holdings, particularly of junior securities. Investments of this character should be made only after a careful study of the issuing company, the extent of its business development, and the prospects of community growth. The following chapter contains some data relating to business development which may be helpful in this connection.

A WORD OF CAUTION

The general rules laid down herein for testing investments have been developed from certain basic relations which are essential to the successful functioning of all utilities. It has been pointed out, however, that some of the derived relations expressed in the rules apply particularly to utilities with a financial structure of the conventional form, and that, where other forms of financing are encountered, the limitations to the stated rules must be recognized. It is again urged that neither the conventional or special rules regarding utility investments herein discussed, nor other more general guides, can be advantageously followed without reservations and specific studies of particular situations, which should be made subject to discriminating judgment on the part of the investor or his advisers. The careful investor who can command the assistance of experienced investment bankers should consistently seek their advice as a check upon his own investigations.

References to Supplementary Reading

BARRON, C. W.: "Buying a Bond," 1924.
KIRSHMAN, J. E.: "Principles of Investment," A. W. Shaw Co., 1924.
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CHAPTER XIII

TESTS OF UTILITY DEVELOPMENT

The preceding chapter discussed certain financial characteristics of public utilities and tests of their securities as investments. This chapter deals with certain additional tests of public utility projects bearing upon the extent of their property, development of business, normal volume of revenues, and certain other "yardsticks" which may be helpful to a prospective investor, purchaser of public utility property, or promoter of new public service projects.

LIMITATIONS ON USE OF DATA

It is obviously a difficult undertaking to present in a brief space data covering such a wide range of factors which will be helpful in specific cases without being misleading to a reader unfamiliar with the widely varying conditions under which public utilities operate. To provide as far as practicable for these inherent uncertainties, the data given will not ordinarily be in the form of averages of the factors discussed but, rather, the ranges commonly encountered and the reasons for existing variations.

With such reservations a careful student may gain helpful information from the data assembled. Even with the above limitations a further word of caution is offered against the use in specific situations of these or other general data without a careful analysis of their peculiar characteristics, and even then appropriate allowances should be made for unknown conditions. With this preliminary warning as to the limitations upon their use, the following data are presented:

MEASURES OF VALUE

The investigator of an existing or prospective public utility may wish to determine a reasonable relation between the capitalization or value of the property and its physical units, or the business which they yield, measured in money or units of service. A considerable number of existing properties have a capitaliza-

tion substantially in excess of the original cost of their physical property. In some cases this excess is an appropriate provision for going value and other non-physical elements. In other cases the entire capitalization may not thus be accounted for.

Relation of Value to Cost.—In this connection it is of interest to note that the Federal valuation of the railroads of the United States, as far as it has been completed, shows a value coinciding quite closely with outstanding capitalization. A review of valuations, largely from commission or other authoritative sources, covering more than 25 per cent of the total electric railway mileage in the United States, shows totals only about 10 per cent less than outstanding capital. It is probably true that many of these valuations made inadequate provision for non-physical elements. The valuation data here presented deal with the actual cost of utility properties, or the value properly assignable thereto for rate making, for comparison with capitalization, or other similar purposes.

Relation of Investment to Revenue.—Certain approximate relations have already been given between the cost of public utility property and operating revenues. This ratio ordinarily lies between 4 to 1 and 5 to 1, with an appreciable number of cases—largely electric light and gas companies—where this ratio is lower, and a substantial number of other properties—especially railways, electric property in large cities with underground and transmission lines, and hydroelectric plants—with higher ratios. Such measures of cost are not wholly dependable because of wide variations in rates and development of business to which the rates apply.

More accurate measures of cost are found in the standard units with which utility property is measured. Electric railways have such a unit in their track mileage, electric companies in the capacity of their power stations, and gas companies in their plant capacities or annual sales. These physical units are regularly given for a wide range of properties in the financial and technical publications referred to in the preceding chapter.

Effect of Price-level Changes.—The problem of definite measures of value or cost is very much complicated by the radical changes in prices which have occurred during the past ten years. During certain portions of this period costs of equipment were more than double the costs prevailing at the beginning of the period. Progressive public utility properties have made addi-

tions to their equipment throughout this period and, therefore, show in varying degrees a composite picture of costs which is extremely difficult to check.

Chapter VII on Valuation contains tables showing construction cost indexes for various classes of public utility property during the period in question. These tables may be found helpful in reconciling construction costs incurred at different times. Unless otherwise stated, the unit cost data given herein will apply to actual historical conditions, which in most cases means that the major parts of the property elements are included at pre-war prices. It follows that direct comparisons may be made with capitalization but not with present cost of reproduction. With the passage of time and continuance of present price levels, the values yielded by applying the unit cost figures will tend to approach the then cost of reproduction.

Electric power properties show less wide fluctuations in cost per kilowatt of capacity between pre-war and present conditions, because the average size of units installed in recent years has been much larger than that in pre-war years, and this larger size has resulted in a lower unit cost for power-station facilities than would otherwise be the case. To the extent that distribution systems, gas property, street railway trackage and rolling stock, and other similar items have been of comparable size to those purchased in earlier years, the unit costs have fluctuated more widely. So far as copper has entered into public utility construction, its prevailing low price has tended to offset to a limited extent the increased cost of other materials and of labor.

Railway Properties.—Urban electric railway properties show construction costs varying normally between $50,000 and $140,000 per mile of operated track. The factors causing this wide variation in unit cost are primarily paving and traffic density, the latter calling for widely varying numbers of cars per mile of track and corresponding variations in power facilities and storage and repair structures. In small communities with little modern paving and infrequent service the entire cost of the property per mile may, in a few cases of wholly pre-war construction, show less than $50,000 per mile. The upper limit stated of $140,000 is reached in comparatively few large cities with unusual traffic density and completely paved track. Comparatively large cities show costs in the vicinity of $100,000 per mile.

Many railways purchase power wholly or in part from other utilities and, therefore, have a lower investment. In order that the reader may have some idea of the composition of electric railway property, the following table is offered to show the normal percentages of different classes of property which make up an operating system:

Class of Property	Normal Range of Percentage
Track and roadway (except paving)	35 to 50
Paving	7 to 12
Distribution system	7 to 12
Rolling stock	15 to 20
Power stations, transmission, and substations	5 to 20
Storage and repair facilities and miscellaneous	6 to 11

The effect of the absence of power facilities, paving, underground distribution, and other variable factors can be judged from the above table. This table has the physical overheads distributed over its items, but does not include non-physical values, the cost of real estate or private rights of way, or any of the special features incident to rapid transit service. An underground rapid transit system may cost $5,000,000 or more per mile of route. Interurban railway systems cost somewhat less than city lines because of less expensive track structure, other than right-of-way cost, and low density of traffic. The cost of most of the standard interurbans has been under the minimum city unit cost above stated.

Electric Properties.—The cost of urban electric power properties per kilowatt of station capacity ordinarily lies between $250 and $450 per kilowatt of rated generating capacity adequate to serve the entire system with a reasonable margin of reserve. The lower limit, which is not an irreducible one, is found in comparatively small cities where the business is reasonably compact and no underground distribution is required. The upper limit provides for underground distribution and substations in fairly large cities and their surroundings. In an unusually complicated and extensive system, including storage batteries, underground transmission, and sparsely settled outlying territory, the unit cost may materially exceed the upper limit stated. The following table gives a general picture of the distribution of the investment in electric properties among the various classes of items involved:

Class of Property	Normal Range of Percentage
Power station	40 to 50
Transmission lines and substations	0 to 10
Distribution system, overhead	20 to 35
Distribution system, underground	0 to 20
Services and meters	12 to 18
Miscellaneous buildings and equipment	2 to 5

Real estate is not included in the above classification because of its variable although usually small effect. Physical overheads are distributed as in the case of the corresponding railway figures, and non-physical items are excluded.

Gas Properties.—Although it is possible, with gas companies, to determine their cost per unit of manufacturing capacity, the extent of this capacity is so largely dependent upon holder capacity and load factor that it is more common to express investment in terms of annual sales to customers. The range of cost of manufactured gas plants is usually between $4 and $6 per thousand feet of annual sales. The factors affecting the unit cost are density of service (which is particularly important in a gas company), load factor, and, to a minor extent, paving requirements. Gas mains are usually laid in advance of paving or repaving, and so the capital investment in paving is comparatively small.

The distribution of the investment in a normal gas property among various classes of items is approximately shown in the following table:

Class of Property	Normal Range of Percentage
Manufacturing plant and holders	42 to 55
Distribution system	30 to 42
Services and meters	12 to 18
Miscellaneous buildings and equipment	2 to 7

ADEQUACY OF FACILITIES

It is frequently desirable to determine whether an existing utility has equipment and facilities adequately to serve the territory in which it is located, or to estimate the extent of equipment and facilities which should be installed in territory not previously served in order to handle available business. The following approximate figures are offered, applicable to the several classes of utilities under consideration:

Railways.—The best standard by which to gauge the adequacy of railway service is the ratio of track mileage to population, best expressed in miles of track per 100,000 population served. This figure shows a range, under normal conditions, between 40 and 70 miles. It is usually low in small cities, because riding is limited, and in cities of low-grade or congested population. It tends to increase with population and area up to fairly large cities, after which the congestion in very large cities brings about a noticeable decline. The average of six large cities in England and Scotland is only 18.2 miles.[1]

Another measure of railway facilities is the maximum number of passenger cars in regular operation per 100,000 population, the normal range lying between 70 and 120, the number being affected by factors similar to those just referred to in connection with trackage, but with a wider range because of the comparative simplicity and low cost of providing cars for the traffic offered.

Electric Companies.—The best simple measure of the adequacy of an electric supply system to meet the needs of the territory served is its power-station capacity per 1,000 of population served. This figure shows quite a wide range due to differences in industrial power requirements. In manufacturing communities such requirements may far exceed the lighting and other comparatively small service which constitute the bulk of the business in many localities lacking industrial activities. Ignoring extreme cases, including those in which the local railways are supplied with power, the range of power-station installed capacity per 1,000 population will normally be found between 125 and 250 kilowatts.

Gas Plants.—A common measure of gas plant facilities is the miles of main per 1,000 population served. This, again, is a rather indefinite index of adequacy because of wide differences in population and service density. Industrial and other congested cities will show a much lower figure than high-grade residential communities. The normal range will be found between 1.25 and 2 miles. A unit in terms of miles of equivalent 3-inch main, commonly used in checking up unaccounted-for gas, would provide a more stable comparison because large mains used for congested service would increase the equivalent mileage. The necessary data for such a unit are not ordinarily available,

[1] *Elec. Ry. Jour.*, Sept. 20, 1924, p. 457.

however. Daily capacity of works is a less definite index because of the effect of holder capacity, already referred to. Under normal conditions the daily capacity will be found somewhere between 50,000 and 80,000 feet per 1,000 population served.

SERVICE DEVELOPMENT

It is sometimes desirable to distinguish between available facilities and the service which they actually render. The former may be adequate, but the actual service sold may not be on a corresponding scale due to overdevelopment of facilities or underdevelopment of their utilization.

Railways.—The best index of urban railway service is the annual car-miles per capita. This figure shows comparatively small, although still substantial variations with size of community served, tending to increase with population. The normal range ordinarily lies between 30 and 50 per unit of population served. Another guide to service development is the car-miles operated per annum per mile of track. This shows much wider variations, increasing rapidly in cities of large population, due to greater density of population and traffic. This figure may be abnormally low or high if the trackage facilities are liberal or scant. It reaches 100,000 miles in some large cities; it is double that amount on the surface lines in New York City; and it drops down to about 25 per cent of that number in quite small cities. Because of this wide variation, the car mileage per capita unit is more satisfactory.

Electric Companies.—The best index to the availability of electric service is the ratio of meters to population, expressed by the number of meters per hundred of population served. This number is normally found to lie between 15 and 20 meters, with a pronounced upward tendency towards 25, which may be considered as close to saturation on the assumption of about four persons per family and one meter per customer. The range is influenced by the character of the population as well as the new business activities of the utility. The number of meters in southern cities, where the colored population is comparatively large, is noticeably lower than in other parts of the country.

Gas Plants.—The conventional index to gas service development is similar to that above stated for electric companies, namely, the number of meters per hundred of population served. With normal gas companies this unit lies between 12 and 24, a

wider range than with electric companies, and with a number of cities having meters beyond the saturation point suggested for electric meters.

The number of meters per mile of main is a figure often studied by gas experts as a measure of the density of business, which is of particular significance because of the comparatively large investment in the gas distribution systems. The meters per mile of main commonly lie between 100 and 150, but with numerous cases outside these limits, particularly the largest cities which run much higher. New York has over 600.

Published statistics of both electric and gas companies sometimes give number of customers rather than number of meters. The difference is usually small because comparatively few customers are without meters or have more than one meter each.

PATRONAGE DEVELOPMENT

A still further distinction may be drawn between the service available to existing customers and the extent to which they actually utilize it. An electric company may have liberal capacity and a favorable ratio of meters to population, but may actually sell a relatively small amount of service. It is, therefore, desirable to have some further check upon the actual patronage which public utilities enjoy.

Railways.—For electric railways the conventional standard of patronage is the revenue rides per annum per capita, commonly referred to as the "riding habit." This figure also varies widely in communities of different sizes and characteristics. The riding habit in small communities is usually low, but increases rapidly with increase in population.

Engineers who have studied the riding habit in large cities, covering long periods of time, have suggested that this riding habit tends to approach the expression CP^2, C being a constant for a given city and P its population from time to time. This limit could only be reached theoretically under the assumptions that the population remains of uniform density and symmetrically surrounds one central area of business activity; and these conditions never obtain in practice. An approach to the theoretical formula as close as $CP^{1.9}$ has been found in representative cities.[1]

[1] Arnold, B. J., Providence (R. I.) Report, 1911, p. 58.

The riding habit ranges from 300 or more in the largest cities down to less than 100 in cities of less than 25,000 population. Where the population served is at least 100,000 the riding habit should normally be above 200, and for 500,000 or more population it should be above 300. There is a tendency to less divergence in these figures due to the increasing inconvenience and delays incident to the use of automobiles in large cities.

Revenue rides per mile of track per annum are sometimes compiled for statistical purposes but show a very wide range with population served, varying from about 100,000 rides in quite small cities to more than five times that number in the largest cities in which independent rapid transit lines are also operated.

Electric Companies.—The logical index of the extent of patronage of electric service is the kilowatt-hours generated per annum per capita. This figure also varies widely with the character of the community, particularly the extent of industrial activities, and the sales to other utilities, which are becoming an important factor. The range of kilowatt-hours generated per annum per capita for customary light and power service commonly lies between 250 and 500. The kilowatt-hours sold are from 10 to 20 per cent less, depending upon the efficiencies and complexities of transmission and distribution systems.

A further useful index is the kilowatt-hours generated per annum per kilowatt of station capacity, this giving a measure of the extent of use or load factor, assuming that a normal proportion of reserve capacity exists. This figure normally lies between 2,000 and 4,000 kilowatt-hours, with a few companies running as high as 6,000 kilowatt-hours. Actual load factor, the ratio of actual to possible kilowatt-hours, runs as high as 40 to 50 per cent in well-developed steam plants, but is more apt to lie between 30 and 40 per cent.

Gas Plants.—Gas service may similarly be stated in thousands of feet sold per annum per capita in the territory served, the normal range being between 3,000 and 6,000 feet. It is noticeable that the range is considerably smaller with gas companies than with electric companies, due to the comparatively limited industrial use of gas. This range may be substantially broadened in the future if present plans of gas companies for house heating and industrial service materialize. The gas sales per annum per mile of main are also of interest, although subject to considerable range on account of variations in customer den-

sity. The normal range is between 2,500,000 and 4,500,000 feet, except in very large cities where even double the upper limit is exceeded.

REVENUES

The revenues resulting from the use of utility service, the extent of which use has just been considered, depend, of course, upon the rates charged for the service. These rates, based upon cost, are affected by the extent of the investment, the availability or attractiveness of the service, and the development of industrial and other uses—all depending upon tributary population, extent of territory served, and other widely varying factors. Because of such wide variations in revenue, it is difficult to designate unit revenue figures which are generally applicable or helpful, but with the reservations initially made certain normal ranges will be indicated.

Railways.—Railway unit revenues may be expressed in revenues per capita, per track-mile, and per car-mile. All these units tend to increase with increase in population served. The conventional range for urban systems, excluding exceptionally small and large cities, is as follows:

Annual revenue per capita	$ 7.00 to	$ 18.00
Annual revenue per mile of track operated	8,000.00 to	30,000.00
Passenger revenue per passenger car-mile	0.25 to	0.50

Electric Companies.—The most common test of electric revenues is the annual revenue per capita served. This unit also shows substantial variations on account of varying degrees of industrial development, but will normally be found between $10 and $20 per annum.

Gas Plants.—The revenue per capita from gas sales varies between comparatively narrow limits, being normally between $5 and $8 per annum. The revenue per mile of main shows wider variations, normally falling between $3,000 and $7,500 per annum, excluding very small and very large cities.

Special Revenue Analyses.—Because of the wide range in unit revenues shown above, it is desirable to extend the analysis, wherever possible, in order to exclude the classes of business primarily responsible for the range in question. As has been noted in another chapter, it is the custom of public utilities to segregate

their revenues by classes of service. The standard classification is not helpful for present purposes with electric railways, and of little help with gas companies because of the fairly uniform character of service.

Electric companies, on the other hand, yield some helpful data. It is usually possible to segregate earnings from residence service, commercial lighting, commercial power, and street lighting. Residential and commercial lighting are comparatively stable, showing ranges between $2.50 and $4 per capita for the former, and between $2 and $4.50 per capita for the latter. A separate study of residence service shows an average annual use of about 300 kilowatt-hours. With liberal use of portable appliances and electric refrigeration this use may be doubled, and an electric range will raise the total to 2,000 kilowatt-hours or more. Other classes of service do not yield helpful averages.

Street lighting is also fairly stable, showing a normal annual cost for complete installations between 75 cents and $1 per capita, with a pronounced tendency toward the upper limit, and an increasing number of excesses over this limit where white-way lighting is prevalent. The annual earnings from power sales show maximum variations, and it is difficult to set any normal standards. Non-industrial communities may show such revenues as low as $2 per capita, and five times that amount is sometimes found in textile and other industrial centers.

Interurban Railways.—So far, little has been said with reference to unit data applying to interurban railways. Such data are difficult to classify because of the wide range of territory served, scope of business, extent of competition from motor vehicles, and inapplicability of some of the conventional units used for other classes of utilities. It is particularly difficult to select suitable figures for population served. Interurbans usually terminate in some large city, and may pass through other such cities with, possibly, a second large terminal. Where terminal population is served by independent local companies it is commonly excluded, and the figure of population served by the interurbans is restricted to intermediate cities and rural districts through which the line passes, rural population within 1 mile of the line being considered tributary. Such tributary population, before the days of intensive motor vehicle service, yielded annual revenues from $6 to $10 per capita, but such figures are no longer dependable in spite of substantial fare

increases, and stable substitute current figures are not available. The revenue per mile of interurban railway line normally lies between $6,000 and $20,000, of which something like 10 per cent is commonly derived from express and freight business.

APPLICATION OF UNIT DATA

The application of the foregoing data to specific problems involving value, facilities, service, utilization, or revenues should be undertaken in each case after a careful study of the characteristics of the community served, including its population, industries, trade, and civic development, and an equally careful examination of the utility property involved. Where such examination is not possible the information contained in guide books, encyclopedias, reports, and other available publications will be found useful in varying degrees, requiring corresponding latitude in applying "yardsticks."

A considerable number of utilities can be found which yield data departing, perhaps widely, from the ranges given herein. Such departure suggests a careful study of such utilities for abnormal features distinguishing them from the normal properties here considered, rather than a rejection of the unit data, which are based on a careful study of extended resources and accumulated information and experience.

The promoter of a new utility project will, of course, appreciate that initial patronage and revenue will usually be near or below the low limits set for properties of the character involved, and that a considerable number of years may elapse before normal development is reached. Revenue estimates should be made on different bases and checked against each other. For example, the revenues of a railway project should be developed from population, track mileage, and car mileage, and the interrelation of these factors also checked. The author has made many preliminary examinations of existing properties, using such data as are given herein, and has discovered possibilities of business development, curtailment of superfluous service, and other economies which would transform unsuccesssful into profitable operation.

Illustrations.—In order to fix more clearly the significance of the foregoing unit figures, certain existing properties have been

analyzed and some of the corresponding units determined for comparison with the standards presented herein.

Railway.—The first case will be that of a railway serving a southern city with upwards of 100,000 population. This railway made a very poor showing during the war period because of franchise fare restrictions. Ultimately, these restrictions were removed and an average fare of nearly 7 cents was in effect in 1924. The question to be answered from the showing of the company is whether it has recovered or is on the way to recovery from its former financial embarrassment. The approximate 1924 unit figures are as follows:

Cash investment in physical property: $75,000 per mile of track
Conservative present fair value: $96,500 per mile of track
Ratio of cash investment to revenues: 4.25
Ratio of present fair value to revenues: 5.5
Revenues: 33 cents per car-mile; $13.50 per capita; $30,000 per track-mile
Operating expenses: 62 per cent of revenues and 20.5 cents per car-mile
Items in operating expenses:
- Maintenance: 11 per cent of revenues
- Damages: 6.5 per cent of revenues
- Trainmen's wages: 22 per cent of revenues (60 per cent one-man car operation)
- Power cost: 1.25 cents per killowatt-hour (2.1 killowatt-hours per car-mile)

Car-miles: 31 per capita; 53,000 per mile of track
Revenue rides per annum per capita: 150
Track-miles per 100,000 population: 55
Average speed of cars: 8.25 miles

A comparison of the above data with the standard figures contained herein shows few serious discrepancies. The investment ratio is not unusual in spite of the fact that 14 per cent of the investment is represented by paving which covers 70 per cent of the track. The riding habit is lower than the normal average, but is reasonable with a population of which 50 per cent is colored. This in part also accounts for the rather low car mileage. The earnings per mile of track are not unfavorable, showing that the trackage has been adjusted to the character of population. The schedule speed is rather low, due in part to dense automobile traffic which follows the street paving furnished by the railway. The operating ratio of 62 per cent is not inconsistent with the average of railways of its size, but does not permit a full fair

return in addition to taxes and retirements (not included in operating expenses) on either the fair value of the property or cash investment therein. Apparently, the outlook for this property is not wholly unfavorable if further development of business is in prospect.

Electric.—Less complete data are given for an electric company (also located in the South), serving a population of not far from 50,000. This company shows revenues of 1.9 cents per kilowatt-hour sold and $18 per capita. Its revenues from commercial lighting are $6.50 per capita. It distributes more than 1,000 kilowatt-hours per annum per capita. Its street lighting revenues are 75 cents per capita. It has 16 customers for each 100 of population. Its capitalization is about $5 per dollar of revenue, including an expensive hydroelectric development some distance from the city. The rated power station capacity per 1,000 of population is over 600 kilowatts.

The operating ratio of this company is 65 per cent, which, as has been seen, is inconsistent with the investment ratio stated. The unit figures show an unusually high per capita distribution of energy. This is accounted for by the industrial character of the community and is reflected in the low average revenue per kilowatt-hour sold. The commercial lighting revenue per capita is good, and street lighting not low for the character of the community.

This property does not show wholly favorable characteristics in spite of its high energy sales because the ratio of capital to revenues is rather high for consistency with the operating ratio. What this company needs is a lower operating ratio which should be brought about largely by reduction in operating expenses, these being high for the wholesale character of the service.

EFFICIENCY OF OPERATION

A careful investigation of the operations of existing utilities should extend beyond the factors above considered to include certain details of operation and measures of efficiency which may disclose opportunities for improvement. In these days of rapidly increasing tendencies toward consolidation or affiliation of independent properties such studies are particularly important, for, unless operating economies can be substantially improved, as

well as more intensive business development effected, the incentive for such consolidation or affiliation is restricted.

The most common general measure of operating efficiency is the operating ratio referred to in the preceding chapter, this being the ratio of operating expenses to operating revenues. Neither taxes nor provisions for depreciation or retirements are included with expenses in the ratios here discussed. The range of operating ratios encountered in normal public utilities may be roughly stated as follows:

An electric company, operating hydroelectric plants and serving largely wholesale business, may have a ratio as low as 20 or 25 per cent. An electric company, operating steam plants and serving cities and their surroundings, should have a ratio between 40 and 50 per cent, unless the cities are small, the customers scattered, or distribution lines cover a wide range of surrounding territory, in which case the operating ratio may be 60 per cent or even higher. The average ratio shown by the 1922 federal census was 56.8 per cent.

Urban railway systems show less favorable operating ratios, the commonly encountered range being between 60 and 75 per cent, with a considerable number of cases above the upper limit but comparatively few below the lower limit. The average ratio shown by the 1922 federal census was 71.6 per cent.

Gas companies are also less favorably situated than electric companies at the present time, showing ratios normally between 60 and 75 per cent, these limits being the same as stated above for electric railways, but with probably fewer cases over the upper limits.

Some approximate data as to the distribution of operating expenses by classes may be helpful, and the following figures, applicable to the business as a whole, are given in ranges rather than averages, so that they will not be used without discrimination:

Electric company: Class of expense:	Normal Percentage of Revenue
Power production, transmission, and conversion	20 to 25
Distribution	5 to 8
Utilization	1 to 3
Commercial	2 to 5
New business	2 to 5
General and miscellaneous	10 to 15
Total maintenance (distributed above)	4 to 8

	Normal Percentage of Revenue
Urban railway:	
Class of expense:	
Maintenance of track and roadway	7 to 13
Maintenance of equipment	6 to 11
Power production, transmission, and conversion	8 to 15
Platform wages (one- or two-man operation)	20 to 35
Other transportation and traffic expense	5 to 9
Damages	2 to 6
Other general and undistributed	7 to 12
Gas:	
Class of expense:	
Production	35 to 45
Transmission and distribution	8 to 15
Commercial	3 to 6
New business	3 to 6
General and miscellaneous	10 to 15
Total maintenance (distributed above)	4 to 8

Power Efficiency.—The efficiency of power stations operated by public utilities is of considerable importance, particularly with electric companies. This is best measured by the fuel consumption per kilowatt-hour. Where coal is used this figure will commonly be found between 1.5 pounds for large and well-managed stations and 2.5 to 3 pounds for comparatively but not extremely small plants.

The lower limit, which should be considered good economy, has been appreciably bettered by certain large stations, and it is expected that certain very large new stations, with special boiler and other equipment, will produce a kilowatt-hour for 1.0 pound of coal.[1] Such economy is not to be expected without unusual refinements and size of station, at least until some time in the future. Where fuel oil is used not more than 2.0 pounds should be required as an equivalent to 2.5 pounds of good coal.

An analysis of railway operations should include a study of average schedule speed of cars, car-miles operated per annum per car in service, average length of ride, and kilowatt-hours distributed per car-mile. These factors are mentioned without attempt to formulate the standard practice because of the wide range of operating conditions encountered.

The critical student of the operations of any public utility should inquire into the tax situation to determine whether abnormal conditions exist with respect to standard or special taxes and

[1] *Jour., Amer. Inst. Elec. Eng.*, 1923, p. 799.

imposts. The simplest measure of taxes is their relation to gross revenues. The precentage of gross revenues commonly lies between 5 and 9, with cases below the lower limit for property largely outside urban areas, and above the upper limit for properties in large cities, particularly where railway or other special taxes are imposed.

SOURCES OF INFORMATION

Much of the data necessary for developing the unit figures discussed herein are to be found in the books referred to in the preceding chapter, particularly the McGraw and Brown directories and Poor's "Manual." None of these books fully describes the characteristics of the communities served or gives complete details of the utility property. This further information must be obtained from other sources.

In one respect these reference books fail in most cases to give the needed information, *i.e.*, with respect to population served. The population figures commonly given are those of the latest federal census of the cities in which major operations are carried on. In some cases the city area in question coincides closely with the territory served, but usually outlying territory is included, and its population must be added to obtain the population-served figure used herein.

The reference books from which the other data are secured usually list the outlying communities served, and their population can be obtained from census reports. Where the communities under consideration are growing, it is usually necessary to adjust the census figures, which can be done by extrapolation based upon previous record of growth. Local estimates of current population are frequently optimistic and, therefore, not wholly dependable. The files and publications of the national organizations of the utilities contain much information outside the scope of the reference books, and the Federal censuses contain average unit figures of interest, some of which have been embodied herein.

The data in this chapter are presented with much hesitation lest they be applied without due adaptation to special local conditions. Discrimination is necessary in the use of all technical data, and such discrimination is particularly necessary in connection with the data in this chapter.

References to Supplementary Reading

BLAKE and JACKSON: "Electric Railway Transportation," McGraw-Hill Book Co., Inc., 1917.

DOOLITTLE, F. W.: "Studies in the Cost of Urban Transportation Service," American Electric Railway Assn., parts II and III, 1916.

MORGAN, C. S.: "Regulation and the Management of Public Utilities," Houghton, Mifflin & Co., chaps. II and III, 1923.

CHAPTER XIV

PUBLIC OWNERSHIP

The term "public ownership" as used herein is intended to cover ownership and operation of public utilities by national governments or states, municipalities, or other political subdivisions. The term "municipal ownership" is frequently used with similar meaning. This subject has been discussed exhaustively by partisans of both sides for many years and more recently a number of unprejudiced observers have sensed the seriousness of the situation and undertaken to formulate the important fundamental principles involved. This chapter presents certain statistics from governmental and other authoritative sources, from which the reader may draw his own conclusions. These statistics are supplemented by official and other authoritative statements with reference to the advantages and disadvantages of public ownership, and by such further comments and opinions as seem clearly to be justified by the facts.

SCOPE OF STUDY

The analysis of public ownership which follows is limited to utilities in this country, where it has had less extensive application than in Europe. European students of the subject who have visited the United States and our citizens who have studied European conditions are agreed that public ownership has generally been more successful abroad than here, primarily because the average European public official has had broader business experience and works with a higher degree of conscientiousness and efficiency. More men of high standing are willing to accept public office because of the greater freedom from political interference than is found in typical American communities. Some reference will, however, be necessary to relative results of public ownership abroad and private ownership at home.

HISTORY IN UNITED STATES

Public ownership of utilities in the United States is very old if public water service is included. It has been noted in a preceding chapter that Boston established a municipal water system in 1652, and the operation of such service by municipalities has been the common although not universal practice since that time. Other forms of publicly operated utilities have a history of less than one hundred years in the United States. The city of Philadelphia established a municipal gas plant about 1841 and operated it until 1897, since which time it has been leased and operated by private interests.

The first municipal electric light plant was established in 1881 for street lighting, shortly before the completion of the first privately owned central station in New York City in 1882. The first municipal electric railway was built in Monroe, Ala., in 1906 and is still municipally operated with about 9 miles of track and seventeen cars in a community of less than 13,000 population.

EXTENT OF PUBLIC OWNERSHIP

Supplementing the above historical statement, it is next in order to consider the present extent of public ownership in the various classes of utility service. The very common municipal control of water service, already referred to, has a basis in the universal need of water, its use in fire prevention, and the necessity for public health safeguards—none of which factors is prominent in other classes of utility service. For such reasons little of the controversy over the subject of public ownership involves water-supply systems, and so no further attention will be given this phase of the matter other than later to point out certain special characteristics which further distinguish this service.

Gas Plants.—Although public ownership appeared very early in the history of gas plants, its development has been comparatively small. Only about fifty such plants are now supplying manufactured gas in twenty-one states. Such plants sell only about 1½ per cent of the total gas supply of the country, and they reach less than 2 per cent of the population served. They have about 1,900 miles of main, or less than 3 per cent of the total mileage employed in distributing gas. The large cities in which gas plants are publicly operated include Omaha, Neb.,

Richmond, Va., and Duluth, Minn., which together own about 55 per cent of the total publicly owned mileage of mains and sell about one-half of the 6,000,000,000 feet annually distributed by such plants.[1]

Electric Railways.—Electric railways come next in importance in the public ownership field. The 1922 census of electric railways in the United States shows a total publicly owned track mileage of 794, or less than 2 per cent of the total electric railway mileage. These 794 miles are distributed among seventeen systems, including a state-owned system in North Dakota, one small system used for freight distribution, eleven other small properties, none of which has more than 13 miles of track, and four larger properties. Several of the small systems were acquired by municipalities from private owners or receivers after unsuccessful private operation and discontinuance of service either actual or contemplated. Of the larger systems, that in Detroit, with 377 track-miles, is most important. The greater part of this system was purchased from former private owners in 1922. The next largest system is that in Seattle, with 239 track-miles, purchased from private owners in 1919. San Francisco has the system next in importance, with 67 miles of track, part of which was built by the city in 1912 in anticipation of the World's Fair transportation requirements.

Aside from a system of 29 track-miles in St. Petersburg, Fla., acquired from private owners who could not operate it profitably, the balance of the municipally owned railway trackage of the country is in the communities already referred to, which are usually considered too small for profitable rail transportation unless possibly in connection with other forms of utility service. The census data do not contain figures of trackless trolley operation, such as that of the city of New York on Staten Island, nor municipal bus service operated in New York City and elsewhere when not associated with rail transportation.

Financial Results.—As to the financial results of municipal railway operations, the 1922 census shows aggregate revenues of about $23,000,000 and net income of $3,700,000. Ten of the seventeen systems failed to earn any appreciable balance over their costs of operation and interest charges without any provision for taxes. The remaining systems show substantial net

[1] Brown's "Directory of American Gas Companies," 1923.

incomes, in one case (Detroit) after accruals for taxes on physical property consistent with private practice. The accuracy of these reported net incomes is often questioned, and the census authorities in presenting public ownership figures point out the usual omission of taxes and administrative, legal, and other expenses, and other irregularities resulting from lack of systematic accounting. Over 80 per cent of the electric power used by municipal railways is purchased from independent sources.

Electric Light and Power.—The real controversy regarding public ownership in the United States centers in electric light and power properties because of the large number of municipal plants and the comparative simplicity of their construction and operating requirements in small communities. The following table, taken from census reports of the electric industry, shows the number and proportion of existing municipal plants:

Year	Number of municipal plants	Per cent of total electric plants
1892	235	16.2
1902	815	22.5
1907	1,252	26.6
1912	1,562	29.9
1917	2,318	35.4
1922	2,581	40.6

Analysis of Operations.—The consistent increase in number and proportion of municipal plants, as shown in the above total, does not correctly reflect the significance of the municipal ownership movement. Although, as stated, 40.6 per cent of all electric systems were publicly owned in 1922, these systems handled only 4.9 per cent of the total output, this being the identical percentage existing fifteen years earlier. Publicly owned plants have only 6.3 per cent of the total capacity of generating stations. They reach only about 6 per cent of the total population served, but have nearly 10 per cent of the employees and 12.9 per cent of all customers.

Of the 2,581 plants existing in 1922 about 850, or one-third of the total, purchased their entire electric requirements from independent sources and had an average of only three employees each. Others also purchased a large part of their power require-

ments. Only fifty-nine of the total number of these plants were located in cities of more than 25,000 population, and only sixteen in cities of more than 100,000 population. About 85 per cent of the total, or 2,182 plants, were in communities of less than 5,000 inhabitants, and these plants had nearly 40 per cent of the total number of customers. The total population served by publicly owned plants was about 6,500,000 as compared with 60,000,000 served by private plants. The increase in population publicly served in the preceding twenty years was estimated at about 4,000,000 as compared with a 27,000,000 increase in the population served by private plants in the same period. The average size of publicly owned plants having power stations is just under 500 kilowatts, or about one-tenth the average size of the privately owned plants.

REASONS FOR BUILDING MANY MUNICIPAL PLANTS

One important and obvious reason for the existence of so many publicly owned systems is the comparatively high operating cost and unprofitableness of utility plants in small communities. Private investors have naturally hesitated to invest their funds in communities lacking industrial development and other evidences of progressiveness, stability, and growth. The natural desire of such communities for utility service has, therefore, been satisfied by the alternative municipally owned plant, the losses from which could be made up, if necessary, through taxation.

The rapid extension in recent years of transmission lines and interconnection programs has resulted in the discontinuance of many generating stations in small communities, and many isolated hamlets in which an independent generating plant would be prohibitive are now receiving electric service from transmission systems. The small plants which have been abandoned include many municipal installations as well as private ones, and the distribution system and other lighting property of the cities have commonly been purchased by private companies when the transmitted power has been substituted.

ABANDONED MUNICIPAL PLANTS

A survey made in 1925 by the National Electric Light Association indicates that about 860 municipally owned plants had abandoned or sold their lighting property or discontinued the

production of their own power. The accuracy of these figures has been questioned, but at least two-thirds of the cases were based upon official or other reliable authority. A substantial part of the balance of the plants in question was classified as abandoned because no record of their continued existence could be found. The Public Ownership Committee of the National Association of Railroad and Utilities Commissioners has confirmed and used the above figures in its published reports. The extension of transmission systems, above referred to, has made them accessible to many small communities where the owners of the systems have not found it profitable to install distribution systems. A considerable number of such communities have installed municipal distribution systems, and the continued increase in publicly owned plants, in spite of the many abandonments, is probably accounted for largely by such situations.

COSTS OF PUBLIC OPERATION

Supplementing the above data on the scope of publicly owned utilities, it will be of interest to examine their costs of service as compared with privately operated plants. The lack of systematic accounts or incomplete use of prescribed or standardized systems by publicly owned plants, already referred to, often makes accurate comparisons impossible. The public service commissions, which are acquainted officially or otherwise with the operations of municipal plants in the majority of the states, have found much difficulty in interpreting annual reports or other financial statements of the publicly owned systems. Such difficulty is illustrated by the following quotation from an annual report of the New York Commission:

> . . . It is perhaps worth while to say that as a class the municipal electric plants, practically the only form of municipal enterprise which comes within the jurisdiction of this Commission, are the worst of all. Judging solely from the reports which they render to the Public Service Commission, most municipal plants seem to be operated in complete ignorance or disregard of elementary business principles.

Inaccurate Accounting.—In addition to other inaccuracies of accounting records, it is common experience to find that municipal plants fail to make proper charges for the services of other city departments and for the use of city buildings and land. The

omitted services include general administrative supervision, legal, collection, clerical, and other service, to which may be added city water and incidental supplies. No attempt at allocation of taxes is ordinarily made, although such allocation is provided in many of the prescribed accounting systems. Privately owned companies pay taxes averaging about 7.5 per cent of their revenues and frequently running as high as 8 or 10 per cent. To this extent publicly owned plants have the advantage in their direct costs of service and the rates which cover such costs.

The omission of such publicly owned property from the tax rolls naturally requires a higher rate of taxation upon remaining property to recover the fixed cost of municipal administration. It is of interest to note that an analysis of all cities of 30,000 population and over, made in 1921, showed rates in cities with privately owned plants averaging $15.50, whereas the cities having municipally owned plants averaged $19.31. To the extent of exemption from taxation, publicly owned plants transfer a part of the cost of their service from their customers to general taxpayers who do not ordinarily use electric service in proportion to their tax bills.

Massachusetts Experience.—The state of Massachusetts, through its regulatory commission, has for many years required accounting methods for municipal plants in full conformity with private plant methods. Several years ago Dr. Edmond E. Lincoln, while a student in Harvard University, made a careful study of municipal plant operations in Massachusetts. The results of his study were embodied in a book published in 1918,[1] in which he gives his findings of higher operating costs, lower efficiency, more employees per unit of capacity and service, less progressiveness and development of service and equipment, and resulting higher rates. The data contained in this book are summarized in the 1923 report of the Public Ownership Committee of the National Association of Railroad and Public Utilities Commissioners.

Census Reports.—From the 1922 report of the Census Bureau on the electric light and power industry, or from unpublished data from which this report was compiled, it appears that municipal electric plants, which produce less than 5 per cent of

[1] "The Results of Municipal Electric Lighting in Massachusetts."

the kilowatt-hours, use about 10 per cent of the total fuel and have 9.7 per cent of the total employees, the kilowatt-hours produced per employee in municipal plants that generated their entire power requirements in 1922 being 172,000 as compared with 358,000 in private plants.

The average unit revenue for all publicly owned plants in the United States, determined by dividing the revenues from electric sales by the kilowatt-hours sold, amounts to 4.08 cents as compared with the corresponding average for privately owned plants of 2.35 cents, the former being, therefore, 74 per cent higher than the latter. A large part of this difference is, of course, due to the comparatively small size of municipal plants and their necessarily lower efficiency of operation, but other factors, some of which have already been referred to, and others to be later discussed, have an important bearing.

Cost of Money.—It is commonly believed that publicly owned plants have a decided advantage over privately owned plants in the lower cost of money. Publicly owned plants are primarily financed by bond issues which yield 5 per cent or less, whereas privately owned plants are commonly held to be entitled to earn 8 per cent upon the value of their property. Such a difference, if actually existing in the final analysis, would affect the rates for service to the extent of three-eighths of that part of the cost of service representing the return on the investment, or about 12 per cent of the required revenue. A more complete analysis of the situation shows that such difference does not exist without offsetting factors.

The cost of money for any enterprise involves, as was seen in a previous chapter, the two factors of bare interest and risk or insurance. The risk factor varies with the security behind the investment. A municipality, in borrowing money for general purposes, pledges the credit of the city, having behind it the entire investment in private tangible property, thus making the ratio of ultimate assets to the liabilities in question exceptionally high. If, however, the borrowing limit of a city is correspondingly high or its liabilities are otherwise increased out of normal proportion to its assets, a material increase in the risk factor, and, therefore, in the rate at which money can be borrowed, necessarily follows.

A municipality investing large sums in a lighting plant necessarily increases the risk attached to its borrowings not only for

the municipal plant but for all other purposes. Simple computations will show that the increase in interest requirements on total city borrowing might go far toward offsetting the difference between the interest rate on its borrowings for utility service only and the higher rate of return which private public utilities require. This point is very commonly overlooked in public ownership discussions. If all public service in the United States were publicly owned, the public debt would be increased by an amount approximately twice the existing national debt, and such an increase would undoubtedly have a marked effect upon the yield on all government obligations.

Because of legal restrictions on general public debt, publicly owned plants sometimes issue obligations based upon the assets and revenues of the plant itself and not on the credit of the entire city. The yield on bonds issued under such circumstances is not only substantially higher but may equal or exceed that on the bonds of privately owned properties. As an illustration, the city of Seattle in 1923 sold bonds for hydroelectric developments, having as security only the revenues of its electric light and power department. These bonds yielded 5½ per cent. Bonds of stable privately owned utilities were selling at the same time on a lower yield basis, representing, however, only a part of the investment in the properties.

Depreciation.—Among the other general cost items that covering provisions for depreciation appears to have had less attention in publicly than in privately owned plants. The 1922 census data show that municipal figures are generally much lower than the private figures,[1] again indicating cost of service records which are too low.

INEFFICIENCY OF GOVERNMENTAL OPERATIONS

Those who oppose public operation of public utility service stress the relative inefficiency of such operations based not only upon specific data, such as given above, but upon the broader grounds of the general inefficiency of all government activities. As an illustration, they compare two exceptionally large transatlantic liners, the *Majestic* and the *Leviathan*, the first privately owned, the second owned and operated by the United States Shipping Board, having passenger accommodations of 2,850

[1] 1922 Electric Light and Power Census, Table 79.

and 2,650, respectively. The commissary departments show 570 and 857 persons, respectively, and the entire crew, 1,100 and 1,355, respectively. A part of these differences is accounted for by the more exacting laws under which United States shipping operates.

In 1911 the United States had two battleships built from the same design. The *Florida*, built in a private yard, cost $7,000-000 for hull and machinery, whereas the *Utah*, built at the Brooklyn navy yard, cost $9,000,000.

Such illustrations do not need further amplification, but, before leaving the subject of relative costs and charges, it may be pointed out that the publicly operated ferries in New York harbor show fuel, labor, and total costs per nautical mile operated all more than 60 per cent higher than similar privately operated ferries. The annual deficit from the operation of these municipal ferries exceeds $1,500,000. Municipal buses also cost New York taxpayers about $5,000,000 a year, and unrecovered interest on subway investment a much larger amount.

The trackless trolley line operated by the city of New York on Staten Island cost 10.27 cents per passenger in 1923 but only a 5-cent fare was charged.

In 1914 before World War disturbances, the average freight rate per ton-mile on the railroads of the United States was 0.72 cent. The government owned railroads of France, Germany, and Denmark had corresponding rates of 1.33, 1.37, and 2.33 cents, respectively.

Interesting observations on the cost of government work were made by Secretary Hubert Work, Department of the Interior, in an address to the Associated General Contractors, from which the following is quoted:

> It has been frequently stated that the government only gets sixty cents for every dollar it spends for public improvements. The reason given for this is that employees will not work as diligently for a municipality, a county, a state, or the national government, as for private employers. It is also maintained that employees, particularly under the national government, are cloaked with civil service protection and are not required to exercise individual initiative or personal enterprise . . .
>
> For these reasons it is the policy of the Interior Department to let everything possible by contract on competitive bidding.

BUSINESS DEVELOPMENT

The relative extent of business development of publicly owned as compared with privately owned plants deserves brief attention. The census figures already quoted clearly indicate that municipal plants are less intensively developed than private plants. This is shown by the larger proportion of customers as compared with kilowatt-hours, which means a smaller per capita use of service, and the much higher relative number of lighting customers, indicating a lack of development of power and industrial business.

The effect of this lack of business development upon community growth has been pointed out in certain cases. One involves a well-known and efficiently managed municipal plant of long standing in South Norwalk, Conn., a city with water transportation, located on a main trunk-line railroad. Comparison of South Norwalk with other Connecticut cities, having identical transportation advantages but farther from New York, shows that during the last twenty years South Norwalk has had an almost negligible growth in population and industries, whereas Bridgeport and New Haven have each increased more than 50 per cent in population and have expanded industrially to a still greater extent. It cannot be clearly shown that South Norwalk has stagnated solely or primarily because of lack of aggressive public utility service as an encouragement to industry, but other convincing reasons for this stagnation have not appeared.

Telephone Service.—That utility service development is small under public ownership as compared with private ownership, is more clearly shown by statistics of the telephone industry. The following figures show the number of telephones per hundred of population in two American countries where private ownership prevails and certain European countries where public ownership exists:

United States	12.4
Canada	9.8
Germany	3.0
Great Britain	2.1
France	1.2
Italy	0.3
Greece	0.1

In Italy an applicant for telephone service waits four years before the government-owned system supplies it. In Japan the "rights" to take over a relinquished telephone have a substantial

market value. The number of telephone calls per annum per capita in the United States and in Great Britain are 150 and 18, respectively. Greece has recently authorized foreign capitalists to provide and operate a modern and adequate telephone system.

Substantially all the modern inventions and improvements which have brought about increased efficiency and more extended use of telephone service have been developed in the United States under private initiative. The same situation exists in the railroad industry and to a lesser extent in other forms of public service.

Municipal utilities do not ordinarily extend their service outside city boundaries and do not have or avail themselves of opportunities for interconnection for increased efficiency and more intensive use of their facilities. Ambitious plans for interconnection of publicly owned electric systems have been proposed but few of them can show economic justification because of the small power interchange required and the wide separation of the units.

COMMENTS ON PROMINENT MUNICIPAL PLANTS

Although the foregoing discussion and the data given have disclosed in a general way, with reservations due to uncertain accounting methods, the financial results of public operation of utility properties, they do not give details of the operations of certain prominent plants frequently referred to in the discussions of this subject. A brief further consideration of these plants may be of interest to show the reasons for their success or failure and also to point out certain accounting adjustments which are necessary before a true showing of results can be made. The plants which will be considered are the municipal railways in San Francisco, Seattle, and Detroit, and the municipal lighting plants in Seattle, Cleveland, and Los Angeles.

San Francisco.—The city of San Francisco put itself on record more than twenty years ago in favor of municipal ownership of its utilities, and the railway system it now operates in competition with a private company (the property of which it hopes ultimately to acquire) is a partial realization of this policy. A 5-cent fare has been continued in effect on both the municipal and the privately operated railways, the latter still operating about 80 per cent of the total service. The 1922 census report shows a surplus of the municipal railway for that year of $55,670. The

official report of this railway shows, for the year ending June 30, 1922, after allowance for taxes assessed on the same basis as on private railway property, as required by the city charter, a deficit of $190,866, and for the succeeding fiscal year a deficit of $272,045. Without the deduction of taxes, a surplus would have been shown in both these years, but the official report for the fiscal year ending in June, 1924, showed a deficit of $8,374 without deduction for taxes, and $295,230 after such deduction.[1] This showing, in view of the 5-cent fare and competitive operations, does not indicate inefficient management.

Seattle Railway.—The purchase of the Seattle railway system by the city in 1919 was the outcome of the inability of private owners to give satisfactory service and make needed extensions under rates of fare, paving requirements, and other conditions imposed by the city. The purchase price was $15,000,000, which the Washington Commission found to be the actual cash investment in the property, although the cost of reproduction less depreciation was estimated to be about 50 per cent higher. Under private operation the fare was 5 cents with six tickets for 25 cents. The ticket rate was discontinued after municipal acquisition, and the fare was subsequently increased to 10 cents cash and three tickets for 25 cents. In 1923 an effort was made to stimulate traffic by going back to the 5-cent fare, but the excessive revenue losses, approximating $5,000 per diem, required the restoration of the 10-cent fare within a few months.

The official report for the year 1923 shows revenues of about $5,690,600 and net income of about $169,600. The cumulative operations, however, since the purchase of the property, showed a deficit of nearly $1,000,000. Operating expenses are supposed to include provisions for depreciation and amortization, but the amount set up in 1923 was not sufficient to cover amortization requirements alone. It has been estimated that the Seattle railway system under private operation in 1923 would have paid local taxes amounting to about $577,000. In 1924 the Seattle tax rate was $27.85 as compared with $15.47 in 1912, the per capita cost of government in these two years being about $111 and $40, respectively.

Detroit Railway.—The major part of the present Detroit system was purchased from private owners in 1922 after pro-

[1] *Elec. Ry. Jour.*, Feb. 28, 1925, p. 354

longed agitation over fares and inability of the railway company to give satisfactory service at the low rates of fares which the city was willing to authorize. During two prior years there had been limited service on certain new lines built by the city and operated in competition with the private system. The city paid $19,850,000 for the property, largely in municipal bonds. This payment was probably much less than the real value of the property without allowance for franchise limitations, a value of over $30,000,000 having been considered in earlier negotiations. The financial reports of this railway show that it has met all its obligations, including taxes on its physical property, and has a substantial surplus under a rate of fare (6 cents cash plus 1 cent for transfer) slightly higher than that previously charged by the private owners.

Seattle Lighting.—Seattle began its first municipal lighting plant in 1904 and has since added hydro and steam plants of substantial size, so that now, in competition with a private company, it produces about 25 per cent of the total kilowatt-hours. The municipal and private plants operate under the same rate schedules, but the greater part of the wholesale power business is done by the private company. With its smaller and higher rate business the average revenue of the city system per kilowatt-hour in 1923 was 3.09 cents as compared with 1.57 cents earned by the private company. The annual report issued by the electric light plant for 1923 shows a substantial net income and an accumulated surplus of about $6,100,000. A large part of this surplus will be required within the next few years to meet rapidly increasing interest and amortization charges upon outstanding obligations.

Seattle, like some other cities owning electric light plants, has made and published comparisons of its rates with those existing in other cities under private ownership without due reference to local conditions and through the selection of arbitrary amounts of energy used by customers whose costs have been shown. An independent study of residence service conditions in Seattle shows an average use of 45 kilowatt-hours per month. Under the Seattle rate schedule this energy cost is $2.30. Under the rates existing in Spokane (Wash.), and Portland (Ore.), with privately owned plants of comparable size having hydroelectric power, similar service would cost $2.15 and $2.13, respectively. In the latter cities the private companies pay about 8 per cent of

their annual revenues in taxes, whereas in Seattle the taxpayers pay a similar amount in addition to their electric light bills. A comparison of hydro service rates in Seattle with those for steam-generated supply in other cities, even of comparable size, has no necessary significance.

Seattle built its first large hydroelectric plant on the Cedar River with a storage dam which cost $2,370,000 and found, after the completion of the dam, that serious seepage existed throughout the surrounding soil, as had been predicted by geological experts. This seepage has caused considerable property damage and cannot be corrected except at prohibitive cost, with the result that the effective capacity of the plant is much less than was expected and the city has definitely turned to other sources of power for its future dependable supply. The more recent Gorge plant, built on the Skagit River, was estimated to cost $4,713,000, including a concrete storage dam and two steel tower transmission lines to Seattle. This plant was completed in 1924 at an actual cost of over $11,300,000, but with only a timber diversion dam and a one-circuit wood pole line to Seattle.

Cleveland.—The city of Cleveland built its present main power plant in 1914, although for many years previously it had operated small plants in suburbs acquired through annexation. The city plant now does about 13 per cent of the total light and power business in Cleveland, the balance being in the hands of a private company. The city plant has, in general, selected congested residential and business sections of the city for its business, leaving the less profitable and scattered service to the private company. Its maximum rate is 3 cents per kilowatt-hour, although a minimum charge makes it necessary to use not less than 25 kilowatt-hours per month to secure this rate. Furthermore, in January, 1925, a service charge of 30 cents was added to customers' monthly bills. The retail rates of the competing private company are appreciably higher, but its power rates are lower, resulting in an average rate of 1.89 cents as compared with 2.05 cents from the city plant.

In spite of the favorable character of its business, the operation of the city plant has not been profitable on the whole. The actual results from operation are very difficult to determine. Reports from public accountants have shown accounting errors and inconsistencies involving large amounts and difficult to correct. The Cleveland Bureau of Municipal Research has

recently stated that operations from 1915 to 1923, inclusive, resulted in cumulative losses, after providing for taxes of $162,104. The 1924 report of the Public Ownership Committee of the National Association of Railroad and Utilities Commissioners discusses the affairs of this plant, and the recent Roberts audit throws further interesting light on the situation, including a deficit in corrected net income. This Committee report also discusses municipal operations in other cities.

Los Angeles.—The city of Los Angeles purchased in 1922 the local distributing system of the Southern California Edison Company, paying therefor more than $12,000,000. Some years earlier it had undertaken the construction of a hydroelectric plant in connection with the aqueduct which brings the city water supply from the Owens River 240 miles away. The power plant, located about 40 miles from the city, was begun in 1910 and required about five years to build, and cost for plant and lines about $23,500,000.

The Los Angeles Gas and Electric Company still retains its property in Los Angeles, previously in competition with the Southern California Edison Company, and does about one-third of the total light and power business. In 1923 the municipal plant sought to sell $35,000,000 of additional bonds for the purpose of extending its system but met with decisive defeat at the election. After the acquisition of the Edison property the city raised the rates previously in effect, and although some subsequent reduction was made, they are still higher than before the acquisition.

An audit of the books of the lighting plant shows an accumulated surplus at the end of 1923 of about $6,400,000.[1] As an offset to this the city paid from general funds a somewhat larger amount in bond interest during the early years of the project, a part of which might properly have been charged to interest during construction. It is also claimed that the lighting plant has not been charged with services and supplies amounting to very large sums. In considering the surplus which this plant shows on its books it should be borne in mind that no part of the investment of $24,500,000 in the water-supply aqueduct has been charged to the lighting department, it all being carried by the water department, which shows a substantial deficit. If a

[1] *Jour. Elec.*, May 1, 1924, p 311.

proper part of the interest, depreciation, and maintenance on the 200 miles of aqueduct which the lighting plant uses were charged to it, the income statement would be radically changed These charges might well amount to something like $1,000,000 per annum. There is also being lost in city, state, and other taxes, which would otherwise be paid by a private company, approximately $1,000,000 a year, and this must be made up in other ways. If these and other adjustments were made to the 1923 income statement, a large part of the reported total of $2,694,000 would disappear. It is reported that since the municipal acquisition of this property about 80 per cent of the very large increase in industrial power requirements in and around Los Angeles has been supplied from the privately owned utilities.

It may be of interest to note that three of the cities above discussed, Detroit, Seattle, and Los Angeles, in the order named, have the highest cost of municipal administration of any comparable cities in the United States.

Ontario Hydro.—A review of prominent publicly owned American utility properties would not be complete without reference to one outside the borders of the United States which has attracted much attention, the Ontario hydroelectric system. This development had its origin through legislation passed in 1906 creating a commission to supervise electric power generation and distribution. Power was first distributed in 1907 by purchase from private sources. Active development did not begin until 1911, since which time the volume of service and field of activity have rapidly increased until in 1920 the commission had under its control more than 250,000 horsepower of generating capacity, with contemplated expansion to make this amount more than double.

It will be impossible to summarize briefly the vast amount of published material regarding this plant. The Murray report, prepared for the National Electric Light Association in 1922, contains a very complete analysis of the entire situation. This report has been characterized by public ownership advocates as biased and incorrect, but Sir Adam Beck, chairmen of the Ontario Hydro Commission, in a printed "Refutation of Unjust Statements" of over fifty pages, failed to show errors in the Murray report except with respect to a very few unimportant matters. The general conclusions of the Murray report have since been confirmed by

other investigations, reports, and data issued by the Dominion Bureau of Statistics, the Canadian Department of Interior, the Gregory Commission, and the Smithsonian Institution.

Summarizing these studies, it appears that the Hydro Commission has established some exceptionally low rates, but with its peculiar system of adjusting rates to distance from source of supply some of its rates are relatively high. Retail lighting rates, involving service charges based on floor area, work out to more than 7 cents in about sixty communities, more than 10 cents in thirteen communities, and nearly 20 cents in one presumably small distant locality. Very few, if any, comparable private systems have maximum rates higher than 10 cents.

Canadian government statistics show that, after equalization with respect to taxes, the average rates for the Ontario system are higher to the extent of over 30 per cent than those for privately operated service in Quebec, involving nearly the same aggregate capacity. Average rates in Toronto for Hydro power distributed through a city-owned system are higher than those in Montreal, where a private company operates, to the extent of nearly 30 per cent.

The average charges of the Hydro system outside the Niagara district are also higher than those in the state of California, where a wide distribution of hydro service is made by private companies. This restricted comparison was considered fair because more than one-third of the California power is steam generated, and the various plants and customers are widely separated. In spite of the comparatively low rates in the vicinity of the main sources of power at Niagara, the Hydro rates in that area are higher than in Buffalo and other cities within the Niagara district.

The Hydro system has gained its reputation through low rates for retail service in favorable localities at the expense of large and more distant customers. It is charged with extravagance in its capital expenditures, which amount to at least 35 per cent more per unit of capacity than those in Quebec, and with inefficiency in operation, which is in part represented by the number of employees per unit of output, this being 70 per cent in excess of the number employed in Quebec (Dominion Bureau of Statistics).

Attention is also directed in this case, as in others, to the tax exemption of the Hydro property. The Royal Inquiry Com-

mission, appointed by the Ontario government to investigate the administration of the Hydro system, commented in its report upon the tax exemption as follows:

The exemption of taxation resulted in lowering the cost of power to the consumers, but the gain to the consumers is equalled by the loss to the taxpayers in the municipalities in which the developments are located.

It appears from the above official data that the Ontario system has not the superiority which its advocates claim.

OPINIONS ON PUBLIC OWNERSHIP

It may be pertinent at this point to supplement the data already given by citations from and references to the opinions on this subject of certain organizations and individuals whose views are entitled to special weight because of their official position or their public record of impartiality.

Organizations.—Among the organizations in question is the National Association of Railroad and Public Utilities Commissioners, already described, the membership of which has intimate knowledge of both public and private operations. This Association has for many years maintained a Committee on Public Ownership and Operation which has continuously studied the subject and reported annually at the conventions of the Association. The following quotation is taken from the 1923 report of this Committee:

. . . Your committee in 1922 stated its conclusion as follows:

"Private ownership and operation and public regulation is logical, just and equitable and the best system for conducting the business of public utilities that has been or can be devised to meet the needs and requirements of both the utilities and the public served by them."

Your present committee has come to the same conclusion. In fact, it may be said that this is the conclusion of practically all the reports submitted.

The question goes deeper than the comparison of operating results obtained under private management and regulation as compared with the results obtained under government ownership and operation. It is one involving fundamentals of government. Broadly speaking, it involves the proposition of abandoning a form of government meant to be political in its nature and substituting therefor a government to go into business as such and to socialize a large proportion of our individual wealth . . .

Under our present form of regulation the utility business is carried on openly; the results of operation in detail are available to the public constantly; all the activities of utilities in which the public has a reason for

being interested are subject to regulative scrutiny; whatever abuses existed before regulation was instituted have practically ceased to exist, and in general it may be said that no one suggests that the rates charged to the public are unreasonable or extortionate except the ignorant, the demagogue, the unscrupulous politician seeking votes, or the just as unscrupulous newspapers seeking to build up circulation by attacking public utility corporations. Discrimination is practically impossible under regulation.

It is our sincere belief that there are no abuses existing in the utility field which justify any propaganda for government ownership for their correction. It is our belief also that there is no reason whatsoever to believe or anticipate that there could be greater efficiency of operation, greater economies, or greater extension of service than exist under private management and public regulation. We know that the contrary is the fact. Fundamentally, therefore, there does not appear to this committee to be any sound reason, looking at the matter from any point of view whatsoever, why government ownership, or political ownership and management should be substituted for private ownership and management of public utilities subject to governmental regulation . . .

No attempt will be made in this report to make a general comparison of the results of private operation as compared with that of industries governmentally owned and operated. Data on this question are available in increasing volume. General comparison may be said to result wholly in favor of private operation and ownership as compared with governmental ownership and operation. There may be here and there individual instances of municipal operation of a creditable character, and there are here and there some examples of private operation not to the credit of private operation. Making the comparison general and taking the general level of both, the comparison is overwhelmingly in favor of private ownership and operation.

In 1919 The Merchants' Association of New York, representing the progressive business interests of the city, received a report from a committee appointed to study the subject of municipal ownership. The following quotations are taken from the report of the committee and the subsequent resolutions of the Association in conformity with this report:

The fields of politics and economics are dissimilar and separate. The field of politics (meaning thereby the art of government) is mainly the regulation of conduct and the protection of rights. The field of economics is the production and utilization of material things. The principles, the methods and the machinery of political administration are wholly different from those of economic activities and not adapted nor adaptable to the latter. The differences are fundamental and cannot be reconciled. When, therefore, the machinery of political action is applied to economic undertakings it works badly and makes impossible the perfect coordination which can alone, in the economic field, produce efficiency and economy of operation. A brief comparison of the machinery of business with that of political action, will show clearly why political machinery does not and cannot work effectively in the field of economics . . .

RESOLVED, By The Merchants' Association of New York that governmental methods in the conduct of business affairs are inherently defective by reason of the fundamental restrictions imposed by our form of government; and that such methods are often inefficient and wasteful and therefore unsuited to the conduct of business undertakings; And be it further.

RESOLVED, That The Merchants' Association of New York is opposed to government ownership and operation of railroads, telephones, telegraphs, and other public utilities, believing that such utilities are far more effectively operated under private ownership, subject to public regulation, than would be possible under governmental ownership and operation, and that it would be a national calamity to subject these instruments, indispensable to the welfare of the whole country to the hampering, inefficient and wasteful methods inseparable from governmental undertakings.

The Chamber of Commerce of the United States, made up of local trade organizations throughout the country, has also studied the results of public ownership in the United States and abroad through a special committee. The following is quoted from the report of this committee made in 1923 and approved by the Chamber:

The higher expenses of Government management as compared with private operation readily account for the fact that railway charges are usually higher upon Government railroads than upon those privately owned and operated. The freight rates of American railroads are the lowest in the world. This has been made possible by the efficient development and operation of railroads under private management. Government ownership and operation of the railroads in this country would necessitate an increase in rates and fares, or Congressional appropriations would have to be made to meet annually recurring deficits.

The Chamber later formally presented its views in conformity with this report to the President of the United States. Its President, Julius H. Barnes, also made the following statement in his 1924 annual address:

Organized business must make clear that its opposition to Government ownership and operation in the field of private effort rests on the same profound truth that this advance in living standards and human opportunity is checked and undermined when the lethargy of Government politics replaces the driving force of private initiative and private enterprise.

These are profound truths which the American public is perfectly able to comprehend when presented by logic and conviction. Too long, organized business has allowed itself to be represented as holding these opinions solely in the selfish protection of business earnings, instead of making clear that on these truths rests the whole field of opportunity for coming generations of American youth.

Public Officials.—Supplementing the above views of organizations are the following statements from public officials who have had intimate contact with public utility affairs:

Halford Erickson, Wisconsin Commissioner: Municipal plants are exceedingly backward in their methods of bookkeeping. In one year 161 out of 177 municipal plants in Wisconsin failed to keep their accounts in such a way as to disclose the true results of operation.

S. S. Kendall, Colorado Commissioner: It is a notorious fact that very few cities and towns have the slightest conception as to what it costs them to build, operate and maintain a municipal utility plant. Possibly in some instances they don't care, but as a plain business proposition they should know whether it is being maintained partly from general revenue of the municipality. It is very natural, however, that city officials want to make as good a showing as possible, and are only too willing to allow their successors to assume the burden of renewals to the property.

Paul P. Haynes, Indiana Commissioner: No city primarily governed by political rule possesses, or can be certain that it will long possess these qualifications so essential to the public utility business. No city, the policies of which are determined by popular vote, can long continue to apply sound economic principles and business methods to its ownership and operation of utility properties—and the simple reason is that cities are essentially *political* agencies—not necessarily partisan, but broadly speaking—political . . .

. . . I state it as a fact, based on first-hand knowledge of a large number of properties, that the service rendered by municipally owned plants is inferior to the service rendered by privately owned plants . . .

I have made a sufficient study of the comparative results of operation in other states to convince me that the general experience throughout the country coincides with the experience in Indiana. It must be apparent to the unprejudiced student of this question, that the extravagance, waste and inefficiency which generally are found in municipally owned plants are a telling argument against political ownership and disclose an unhealthful condition of civic affairs.

Edward N. Hurley, United States Shipping Board: With our form of government, whether federal, state or municipal, we must have individual responsibility rather than legislative responsibility. Without individual responsibility we cannot have business methods. That is why a government undertaking rarely gets through on the appropriation given it. The personal relation to the money is not present. If a private corporation incurs debts that it cannot pay, it fails and the officers lose their jobs. But the government undertaking merely goes back to the trough for more money. There is a big difference, and whatever the theoretical savings we may plan for public ownership they are wiped out in practice by the decrease in the efficiency of human beings. Government operation in industrial service is a flat failure from a service-to-the-public standpoint, as well as from the standpoint of financial returns, which should have a bearing on the case for taxpayers.

Charles G. Dawes, Vice-president: Public operation, wherever it has been tried, has meant political operation, and political operation has always been and will always be fatal to the interests of the public.

O. C. Merrill, Executive Secretary, Federal Power Commission: Until the character of our political institutions is radically altered, it will never be practicable to secure and retain in public management the character of personnel which private management can secure, or to free public operations from political control.

Calvin Coolidge, President: . . . Measured by our experience, by efficiency of service, by rate of wages paid, we have everything to lose and nothing to gain by public ownership. It would be a most perilous undertaking, both to the welfare of business and the independence of the people.

The government and its agents are not in possession of any resources, ability, wisdom, or altruism except that which they secure from private life.

The above quotations have been selected, as explained, for the impartiality of their sources. Many additional but less impartial arguments in favor of or opposed to public ownership might be added, but such statements would naturally have less weight than those quoted. Attention is again directed to the uncertainties surrounding much of the data from publicly owned plants. Where audits have been made by competent accountants, their corrected statements almost always show a less favorable financial condition than those set up in published reports.

The official attitude of the regulatory commissions, as distinct from the views of their unofficial Association, is disclosed in numerous reports and cases. The commissions have generally favored provisions in the public utility laws giving them authority over the establishment of both public and private plants. They have not favored municipal competition and in certain cases have emphatically refused to grant a certificate of convenience and necessity on the ground that the cost of utility service would be increased thereby. The Maryland Commission in a recent case said:

In our judgment, the approval of the bond issue, and the building of the new municipal plant as planned, would result in a deficit and require more money than has been provided, would ultimately lead to higher rates, would interfere with the reduction of rates in the surrounding territory, and would retard the accomplishment of the administrative plans formulated by the Commission and already partly realized for the extension of electrical service to every village, hamlet, farmhouse, and dairy in western Maryland.[1]

[1] *Re Hagerstown,* P.U.R. 1924 B, 211, 217.

It appears from the quotations and preceding data that, in general, public ownership is less efficient and less progressive, and results in higher average rates in addition to loss in taxes—all in addition to less satisfactory and reliable service. There are those who will insist that the opinions quoted are not unprejudiced and that statistical data do not clearly exhibit the relative advantages of public ownership. It may even be admitted, in some instances at least, that public ownership in the final analysis is more expensive, but it is claimed that such ownership is still desirable because of its freedom from corporate domination and the ability of citizens to determine without restraint the character and scope of utility service which they will support.

FUNDAMENTAL FACTORS INVOLVED IN PUBLIC OWNERSHIP

For these and other reasons it will be desirable to make some further study of certain fundamental factors which enter into the problem of the desirability or undesirability of public ownership. The first factor to be considered is the relative permanence of administration in private as compared with public service. The history of successful private corporations shows a permanence in their administrative organization far greater than that in any government service. The typical corporate executive is a man who began as a humble employee in his chosen field and worked up through the ranks, acquiring in each step experience and judgment which qualify him for the executive position which he reaches after many years. The boards of directors of large corporations to which the executives are responsible have a similar record of stability in policy, although often without the same permanence in complete personnel.

Unstable Administration.—On the other hand, government executives of higher rank commonly have a tenure of office of not more than four years and are often unable fully to grasp the complexities of their duties before a successor appears. The postmasters-general, managing a business with more than $500,000,000 annual revenues, have served on an average only 2.8 years. A business concern with such instability of administrative personnel and policy could survive only by a combination of favorable circumstances rarely if ever encountered.

Public service corporations of the United States have a capital in the vicinity of $40,000,000,000, which requires an annual

increase of about $3,000,000,000 in addition to frequent refinancing. This construction budget supplements the disbursements of annual revenues amounting to about $10,000,000,000. The control of such stupendous annual expenditures for complex business operations calls for administrative ability greater than that now available in any single administrative organization, public or private, and no private investor would consider entrusting his funds to transitory executives and boards of directors at salaries now paid to public administrative officers and members of Congress, the latter being the real board of directors of federal undertakings, with partial change in membership every two years.

Political Activities of Employees.—The second factor to be considered is that of the operating personnel of publicly owned utilities. The governmental agencies now have approximately 3,000,000 employees who receive $35,000,000,000 annually for their services. The railroads and other utility corporations in the United States have about 2,700,000 employees. If all utility service came under governmental supervision, the total number of employees, approaching 6,000,000, would, without further increases, have with their families and friends more votes than those ever cast for any presidential candidate. The political power of such an organization and the extent to which it might be exercised in controlling legislative bodies and perhaps courts, and through them fixing wages and working conditions, can hardly be realized. This danger is not wholly imaginary, for already such steps have been taken in a large municipally owned railway system, the employees of which, failing to secure desired wage increases from the existing city administration, organized a political movement to substitute a more friendly administration.

Civil Service.—It is not to be supposed that 3,000,000 employees would be added to the public payroll other than under civil service regulations. The effect of existing regulations upon civil service employees is well known. The recognized evils of political appointments have been avoided, but in their place there has developed a tendency toward comparatively indifferent service in an assured permanent position without adequate provision for promotion in proportion to ability, and that lack of incentive, responsibility, and progressiveness which characterize all government service. A large part of the progress made

in private business comes from the initiative and alertness of employees who seek to accomplish more for their employers and simultaneously improve their own conditions and prospects.

Lack of Incentive.—This lack of initiative and incentive permeating government organizations is largely responsible for the fact, already noted, that the notable improvements in public utility service have all been made under corporate administration. Private organizations are free to carry on extensive research and experimental work in the hope of developing new processes and facilities which will reduce the cost of production and yield greater profits. Much of this experimental work fails to produce result but it is, nevertheless, continued, and the net result is evidenced by constant improvements in industrial processes. Governmental bodies have neither the foresight nor the courage to make large appropriations for such purposes, and their administrative officers who may propose them receive little encouragement. The inevitable result is shown in less modern facilities in publicly owned projects and in the comparative inefficiency inherent therein.

In addition to the illustrations already given of the relative progressiveness of private undertakings, it may be pointed out that New York City alone generates more electrical energy than the whole of Great Britain with its multiplicity of independent publicly owned electric plants. In Greater London alone there are not less than 70 electric power plants operated by 50 different organizations, with 24 different service voltages and 10 different alternating-current frequencies.

PUBLIC OPERATION OF CERTAIN SERVICE LOGICAL

The proponents of public ownership may point to the operations of the Federal Post Office Department and many municipally owned water-supply, sewerage, and other systems in opposition to the conclusions above stated. Dr. Arthur T. Hadley, President Emeritus of Yale University, in a paper presented to the World Power Conference held in London in 1924, pointed out a distinction which should be made in classes of public service. He held that the post office and water-supply agencies are representative of public service which requires either a small investment or an investment in standardized facilities which demand comparatively little skilled attention. The operations of such

agencies call for honest and faithful service rather than ability and aggressiveness.

In contrast to these classes of service are the electric light and power and railway industries and gas manufacturing, in all of which many skilled employees and complicated machinery and highly developed technical processes are employed—all subject to obsolescence and supersession and requiring the highest degree of engineering and administrative skill to yield efficient and adequate service. It is Dr. Hadley's opinion that the latter class of utilities should clearly be left under private control because of the limitations stated. Dr. Hadley's conclusions are briefly stated in the following quotation from his paper which deals primarily with electric plants:

> The history of State management of progressive industries in the last hundred years creates a strong presumption against the encouragement of Government-owned electric plants by special privileges. Our brief experience with the electrical industry itself has, in the opinion of the National Association of Railroad and Utilities Commissioners of the United States, tended strongly to confirm that presumption. Under conditions like this the policy of exempting Government-owned plants from taxation is an unwise one to continue, and the proposal to create a Government monopoly is wholly unwarranted by past experience.

A recent economic writer[1] has pointed out other specific reasons why certain public service can be performed economically under public ownership whereas the remaining classes of such service cannot. The discussion involves the ratio of investment to revenues and the operating ratio, which, as has been seen in Chap. XII, should have a fairly definite relation to each other. On the assumption that government bodies can borrow money at lower rates than private corporations but that government operation is less efficient than private operation, it follows that where the investment ratio is particularly high and the operating ratio correspondingly low, publicly operated service may involve less over-all cost than privately operated service.

Water Supply.—The water-supply systems, referred to by Dr. Hadley, are typical illustrations of this situation. On the other hand, where investment ratios are low and operating ratios are correspondingly high, a point is reached where the advantages of public operation disappear and private operation becomes

[1] KOTANY, L., "The Socialization of Industries," *Amer. Econ. Rev. Supp.*, Mar., 1924, p. 127.

economical. The dividing line, as measured by operating or investment ratios, will, of course, depend upon relative costs of money and relative operating efficiencies. Within the limits of such differences as now exist, or would exist under heavier municipal indebtedness, it is obvious that transportation agencies and other forms of public utility service having similar operating ratios should be privately operated, whereas water-supply systems should be publicly operated.

Under this method of analysis hydroelectric power plants might come within the publicly operated classification, but the dependence of such plants upon auxiliary steam plants for maximum economy, their intimate relation to other classes of public utility service, and the increasingly widespread interconnection of large power systems, including both hydro and steam plants, all tend to remove the hydro plants from the public ownership classification.

TAX EXEMPTION

Dr. Hadley's reference to tax exemption warrants further consideration. Public service corporations are now paying taxes to the extent of more than $600,000,000. Under public ownership this source of taxation would disappear without any corresponding reduction in governmental costs. It would, therefore, be necessary to increase the taxes on remaining private property to make up this difference. In some parts of the country the increase in tax rates would not be prohibitive, but in sparsely settled western sections, where a large part of the present taxes are paid by railroads and other utilities, an increase of 40 per cent or more would be necessary to offset the loss from present sources. Such increases would be ruinous to the agricultural districts in question.

Public ownership would mean the disappearance not only of taxes from private corporations and property but from many employees who now pay income taxes in substantial amounts. The extent to which employees in public service would be exempt from federal income taxes, at least in self-supporting undertakings, is uncertain at the present moment, but the total loss in state and federal taxes from such exemptions as may prevail would undoubtedly be quite large and would require a further increase in taxes upon other property or individuals to offset it. As indicating the interest in such tax exemption, it may be

noted that the California State Grange, the California Farm Bureau Federation, and the California Farmers' Union all passed resolutions in their 1924 conventions urging the legislature to take steps looking to a constitutional amendment to require publicly owned utilities to pay the same taxes as if privately owned, thereby effecting a "just and equitable distribution of the tax burden."

TRUSTEE OPERATION

Before passing from the consideration of public ownership, further reference should be made to a compromise form of operation embodied in Massachusetts legislation, referred to in Chap. III. Under an act passed in 1918 the property of the Boston Elevated Railway Company came under the control of a board of five trustees, to be administered in such manner that adequate service should at all times be rendered, the property fully maintained, and the ownership thereof receive a stipulated and guaranteed return upon their holdings. The trustees are free to fix from time to time any rate and form of fare necessary to recover the full cost of service, and to call upon the treasurer of the Commonwealth to make up any deficits temporarily resulting from inadequate fares. The property will be administered in this manner without any interference on the part of its private owners or other regulatory agencies for a period of ten years, and thereafter unless or until the legislature terminates the trust, in which event the property reverts to its private owners, who retain the rights established under the trust with respect to their rate of return and the adjustment of fares to meet the full cost of service.

So far the operation of this property has been in the hands of trustees of ability and business experience, free from political entanglements, with assurance of a tenure of office of at least ten years. The trustees have improved both property and service, and although the fares have been as high as any existing in the country (due in some measure to necessary rehabilitation of the property), the trustee operation has been generally satisfactory to all interested parties. The 6 per cent guaranteed return on the common stock of the company indicates a lower fair return than that required by public utilities without such guarantees, but this return has not yet brought the market quotations on the stock up to par.

Success in Boston.—The advantages of trustee operation so far disclosed in Boston lie in the ability of the trustees to furnish any form and extent of service which the patrons are willing to pay for, and the freedom of the trustees from political obligations or entanglements, which has permitted efficient service and more modern facilities. Less pressure for economy in operation probably exists than under private management, as indicated by the trend of wages. Under repeated arbitrations of wage questions the trustees have submitted carefully prepared data on the trend of living costs and general prices, the wage scales in other cities, and prevailing local wages for work requiring similar ability, but there has been no forceful direct presentation of the public interest in keeping fares as low as possible, consistent with reasonable wage and other standards. The level of trainmen's wages in Boston is exceeded by only one other city—Chicago. In the final analysis the Boston trustee operation plan does not differ essentially from operation under the various service-at-cost franchises or, except for promptness of action, from the results of regulation by state commissions. It is doubtful, therefore, whether the trustee form of operation will have wide application. It has the advantage over public ownership that the property may be turned back to its owners at stated intervals if or when further public control ceases to be advantageous.

Jacksonville Experience.—Trustee operation, with public ownership, but free from political control, has been tried with success in a few instances. As an example, the city of Jacksonville (Fla.), has for many years owned and operated an electric plant under the exclusive supervision of the trustees of its bond issues, who are men of wide business experience and high standing in the community and who have consistently resisted any efforts toward political domination. The Jacksonville plant has had a favorable financial record throughout, has developed its property in a business-like way, partly from earnings, with rates which have been reasonably but not exceptionally low. Such cases have, however, been comparatively rare in municipal ownership history.

PUBLIC OWNERSHIP WITH PRIVATE OPERATION

Another phase of government activity not yet touched upon involves public ownership with private operation. This has its best illustration in rapid transit systems in some large cities

where subways have been built by cities or states and leased to railway corporations at a rental intended to cover carrying charges and the amortization of the investment in a suitable period of years, usually not less than fifty. The advantage in this arrangement lies in the comparatively low rate at which governmental bodies can secure funds for such construction within reasonable limits of expenditure in relation to normal municipal debt.

Where the construction of such facilities is efficiently administered and equitable operating agreements are made, such arrangements have definite advantages. It has even been proposed in some cases that the cities construct and own surface trackage for electric railways, leasing them to operating companies which provide their own rolling stock, power facilities, and other structures on private property. So far there has been no actual experience on any large scale under such an arrangement.

Public ownership of subways or elevated structures has a further advantage, in that an equitable proportion of the cost can be assessed upon property owners who benefit therefrom. Such benefit in many cases is very great, as evidenced by the rapid rise in suburban real estate values following the construction of rapid transit lines in large cities. Certain cities, notably Detroit, have made a careful study of this problem and worked out definite plans by which neighboring real estate can be assessed to cover a large part of the cost of rapid transit construction without, in so doing, drawing excessively upon the appreciation which would result in the value of the property.

The authoritative views herein expressed as to political interference and the lack of incentive for economy and business development still apply and will continue to apply to the great majority of cases. Regulatory powers as developed within the last twenty years, with their elimination of excessive returns and overcapitalization, and stabilization of return and credit, have removed one of the primary motives for public ownership.

CUSTOMER OWNERSHIP

One of the factors which influenced the early tendency toward public ownership was absentee or so-called "Wall Street" ownership of private utilities. In the early days of public utilities local confidence in their operations was not sufficient to induce investment in anything like the amounts necessary to finance

the growth of the properties. The companies, therefore, were obliged to seek needed funds in the larger money markets. The customers of utilities thus financed were not unnaturally suspicious of exorbitant profits going to unknown owners, and municipal ownership was the only alternative.

History.—With the passage of time and the increasing stability of public utilities, local purchasers of their securities become more common, but no extensive efforts were made to secure local ownership until about 1919, although the movement was begun in a small way five years earlier by certain western companies, particularly the Pacific Gas and Electric Company.

The so-called customer-ownership movement then inaugurated has since attracted increasingly wide attention. There were two fundamental reasons for this movement: (1) the difficulty of securing capital from large investors on account of high income taxes and the war and post-war exceptional demands for capital; and (2) a feeling on the part of the utilities that local ownership would bring about improved public relations and greater cooperation between utilities and their patrons.

Development.—Customer ownership was first undertaken on a large scale by light and power companies. In 1920 these companies sold not less than $35,000,000 of their securities to their customers. In 1922 the sales were $175,000,000. By 1924 they had increased to about $200,000,000, distributed among 225,000 customers. The total amount of securities now in the hands of customers of public utilities is estimated at more than $1,000,000,000, distributed among about 1,000,000 customers. The number of customer owners is now greater than the total number of owners ten years ago. Employees of the utilities have not been overlooked in this movement, and the number of employee investors is now greater than the total number of stockholders ten years ago.

The activities of certain large companies in this field may be of interest. In 1919, before the customer-ownership movement was undertaken, the Commonwealth Edison Company of Chicago had 7,000 stockholders. In August, 1924, it had about 43,000 stockholders in addition to about 4,000 employees who were purchasing stock on the partial-payment plan. Together, they own nearly 90 per cent of the total outstanding stock.

During the same period the Public Service Company of Northern Illinois (also an Insull property) increased its stockholders

from about 2,750 to 26,000. At the end of 1923 the Middle West Utilities Company (another Insull property) had about 54,000 stockholders. In 1917 the Southern California Edison Company had about 2,000 stockholders, and has since sold nearly $50,000-000 of stock to more than 60,000 new owners. The Byllesby group of companies has sold nearly the same amount of stock to 88,000 new owners.

The Customer Ownership Committee of the National Electric Light Association, which has actively assisted in this movement, reported in 1924 that not less than 185 light and power companies were selling junior securities to their customers, these companies serving 45 per cent of the population of the United States and having 65 per cent of the entire revenues of the light and power industry.[1]

The telephone companies have also been active in this movement, the American Telephone and Telegraph Company and its subsidiaries having at the middle of 1924 more than 425,000 stockholders, no one of which held more than 1 per cent of the outstanding stock. Gas companies have also been active in this movement to a substantial extent. The Consolidated Gas Company of New York in 1924 sold 600,000 shares of its common stock to 18,566 purchasers, the applications for this stock amounting to four times the available supply.

Electric railways have been less active in selling their stock because of less favorable credit conditions, but a number of companies have sold substantial amounts. It is of interest to note that employees of the Philadelphia Rapid Transit Company already own, directly or through their cooperative organizations, more than 26 per cent of the company's outstanding stock.

Many of the early sales of securities were in the form of notes or other obligations. The success of these sales led to the substitution of preferred stock and, more recently, to the general offering of common stock. It has been pointed out that the sale of junior issues to customers should not be undertaken without careful consideration of the obligations assumed and the risks involved. A large proportion of the customer purchasers are not experienced investors and would be seriously disturbed by curtailment or suspension of dividends. The resentment which might follow might more than offset the improvement in public

[1] *Proc. Nat. Elec. Light Assn.*, 1924, p. 196.

relations which had developed from the cooperative relations previously established.

Advantages.—Local ownership, however, tends to strengthen the financial position of the utilities and to lessen the risks of undue curtailment of revenues by municipal or other regulatory authorities. Customer ownership of public utility securities has the further advantage of offering a continuous opportunity for added investment because of the steady growth of the properties and their constant need of capital additions. Such investments are of advantage to the customer in that he can see the property in which he has ownership and take pride in its success. He, in turn, may be helpful through criticisms or comments on the operations of the property.

Customer ownership sales have been conducted by the companies themselves with the assistance of their employees, who have been paid commissions for their work, carried on in connection with their regular duties. The commissions and other expenses of the sales have amounted on the average to somewhat less than the fees usually paid to investment bankers for selling services and obligations. This movement has, nevertheless, had the full approval of the investment banking interests because of its broadening of the investment market and its encouragement of saving by people of small incomes.

Substitute for Public Ownership.—The customer ownership movement has been introduced in this chapter on public ownership because, in the opinion of many careful students of the situation, it offers an attractive and logical substitute for the earlier public ownership movement. That it is, in fact, so considered is shown by recent history in certain western states. In 1922 the voters of California rejected by a very large majority the Water and Power Bill to create a state-wide commission with authority to acquire and operate, with an initial authorized capital of $500,000,000, public utility enterprises throughout that state. This act, with some modifications, was again voted upon in 1924, and its decisive defeat was repeated. It is of interest to note that the act was rejected in Los Angeles and Pasadena counties, where municipal ownership of light and power companies prevails, by a vote of over 3 to 1; whereas in San Francisco County where similar municipal ownership has not been undertaken on as large a scale, the rejection was by a vote of 2 to 1. Apparently, municipal ownership is less attractive to

those in California who have had experience with it than to those who have not.

In 1924 also, the voters of the state of Washington rejected the Bone Bill, which provided for more extended operation of municipal plants. This vote also was decisive and was substantially influenced, as was the case in California, by the development of the customer-ownership movement. The logic in the substitution of customer ownership for general public ownership lies in the fact that those of the public who do not utilize utility service are not directly interested in its successful functioning, at any rate to the extent of assuming obligations of making up through taxes any deficits which may and frequently do occur in municipal plant operations.

To the extent that utilities are owned and controlled by the people who patronize them, one of the principal aims of public ownership is accomplished. The private local owner may demand more for the use of his money than the purchaser of municipal bonds but, as already pointed out, he may insist upon a degree of efficiency in operation which more than offsets his higher interest or dividend requirements. Furthermore, he is a local investor, whereas municipal bonds are commonly sold in the money centers to remote and unknown investors who have no direct interest in the projects.

It has previously been shown that regulation has already succeeded in removing many of the earlier motives for public ownership. With the further development of both regulation and customer ownership there remains, in the opinion of unprejudiced students, no further real excuse for public ownership or operation of utility facilities in communities of sufficient size and stability to attract private capital.

SUCCESSFUL ECONOMIC POLICIES SHOULD BE SUPPORTED

In spite of the absence of sound economic reasons for enlargement of publicly owned activities, socialistic agitation will doubtless continue and must be opposed not only by the public utilities interested but also by all other public spirited citizens who believe in the soundness of American institutions. No proponent of socialism has yet pointed to any country which has practiced public ownership of industry on a large scale where general prosperity has even approached the degree existing in the United

States. American records of savings deposits of 36,000,000 people now exceeding $21,000,000,000, life insurance increasing by more than $8,000,000,000 annually, 50 per cent of the population living in their own homes, 72 per cent of farm land cultivated by its owners, employee ownership in industry to the extent of hundreds of millions of dollars, and the high standards of living and education, have never been paralleled in history.

A striking illustration of the prosperity of the country is the use of automobiles. At the end of 1924 the aggregate registration exceeded 17,500,000, or nearly one car for every six persons. With 6 per cent of the world's population, this country has 87 per cent of the world's motor vehicles and spends $68 per annum per family for gasoline. The average family also spends $100 a year for ice cream and candy, and $95 for tobacco. In keeping posted on current affairs it annually uses up twice as many pounds of newsprint per person as any other country. In the face of such an exceptional showing of the advantages of American economic policies, any radical change in these policies or reversion to Old World practices can have little support.

Herbert Hoover, Secretary of Commerce, very aptly reviewed the situation in a forceful address on government ownership, delivered in Washington in September, 1924, in which he said:

> We have constructed our government upon the theme that its major purpose is to preserve human liberty amid the changing social and economic scene. If we divert it to the changing of money we shall have lost sadly for the future.

To summarize briefly the foregoing consideration of public ownership: it appears that statistical and financial data and authoritative opinion agree that publicly owned plants are more costly in construction and operation, are less progressive in developing their facilities and business, and are subject to political influence or control which destroys individual initiative and efficiency and tends to bureaucratic domination of civic and dustrial life. The only offsetting advantage lies in the lower cost of money, and this minor advantage would tend to disappear with any large increase in public debt for industrial purposes. Public regulation of privately owned utilities has largely removed the reasons for public ownership, and the more recent customer-ownership movement has pointed the way to

a wholly satisfactory and complete elimination of public ownership from the field of normal utility service.

> "Where the people are the government, they do not get rid of their burdens by attempting to unload them on the government."
>
> (CALVIN COOLIDGE)

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CHAPTER XV

PUBLIC RELATIONS

It was stated in the introductory chapter that public utility history might be divided into four fairly distinct periods in which the predominant activities were, respectively, pioneering, engineering, commercial, and public relations. Public relations activities have been prominent for about ten years, during which emphasis has been directed toward more intimate contact not only with utility customers and public officials but also with the general public which is affected, at least indirectly, by the adequacy and efficiency of public service.

MUTUALITY OF UTILITY AND COMMUNITY INTEREST

During this period public utilities have come to appreciate more clearly than many other industries a fundamental principle of business relations: that a successful trade must be of advantage to both parties concerned. If in the long run one of the parties involved in business dealings fails to benefit, he will sooner or later seek other means of satisfying his needs. Ithas been seen that the prosperity of public utility business is very intimately bound up with that of the community served. Both must be prosperous or both will suffer from the failure of either to succeed.

This mutuality of interest is often overlooked by people who fail to realize the essential character of public utility service. Experienced business men, however, in seeking new localities through which to broaden their activities are in the habit of scrutinizing closely the relations between the local public utilities and the communities, as reflected by city officials, newspapers, and opinions otherwise publicly expressed. If friction exists over franchises, service, or rates, and it appears that rates have been so restricted as to make satisfactory service impossible, such business men will probably conclude that a community maintaining such standards of essential business activity is a good place to avoid. Bankers who were solicited to loan funds to public utilities have sometimes refused solely because of an

unfriendly attitude toward public utilities by city officials or newspapers.

A carefully adjusted balance is necessary in public utility service, particularly with respect to rates. If rates are too high, they may yield returns attractive to the utility for the time being, but the inevitable outcome will be restricted business and limited industrial development, which react unfavorably upon both the utility and the community. If, on the other hand, rates are too low, the credit of the utility will be impaired, its service will necessarily be poor, it will be unable to finance the plant extensions necessary for a growing community, and the community as well as the utility will suffer.

EARLY UTILITY HISTORY

The early financial history of public utilities was not an open book, and it may fairly be said that the utilities were reticent regarding their financial affairs. Such reticence was, however, common business practice, and the public character of the utility business was not then appreciated. It was not unnatural, under such circumstances, that the rapid expansion of electric and other utility properties served to emphasize the popular impressions of undue profits. There was also a common belief that public utilities were overcapitalized as a means of distributing excessive profits without exorbitant dividend rates.

Those who are acquainted with public utility history know that, in the great majority of cases, such impressions were without foundation, and it gradually dawned upon public utility executives that steps should be taken to make publicly known the facts regarding their business. The outcome was the publication in local newspapers and elsewhere of income statements which had previously been restricted to investors and financial publications of limited circulation. Even such publicity did not wholly meet the needs of the situation. The public utility business involves many problems of service, extensions, taxation, paving, and other matters radically different from those encountered in ordinary business affairs, and, therefore, not understood even by experienced business men.

PUBLICITY

The industry decided that these problems were of general public interest because the general public was directly concerned

in their solution. An extensive program of publicity was therefore developed, involving both local and national activities. Local activities included the regular supply to newspapers and other agencies of news items bearing upon construction work, service, schedules, and other current happenings of public interest. Systematic advertising programs were also developed further to inform the public regarding the service, facilities, and problems of the industry. Even the railways, which have a minimum of novelty and diversity to offer, are now spending about $3,000,000 per annum in advertising the advantages and characteristics of their service.

The utilities have been assisted in this work by manufacturers and other allied industries that have conducted extensive campaigns of national advertising in the interests of better and more extensive public utility service.

Public relations departments were organized to handle publicity work and otherwise to establish more intimate contact with public officials, customers, and others. These departments have also undertaken programs of employee education, to which further reference will be made. The national associations of public utilities organized public relations sections or committees for the discussion of the common problems of their members.

Public Information Bureaus

These national activities were later supplemented by the organization of a system of public utility information bureaus, each serving one or more states and being supported by the utilities in the districts served. The first bureau of this character was organized in Illinois in 1919, and its success was so pronounced that the movement rapidly spread throughout the country until now more than three-fourths of the states are served by such committees. The states not so served are in most cases those with scattered population, and for that reason lacking intensive public service development.

The various information bureaus distribute, usually weekly, to newspapers, libraries, educational institutions, chambers of commerce, clubs, public officials, bankers, and others more than 100,000 copies of bulletins or leaflets containing information regarding the everyday affairs of public utilities. People are rarely interested in the troubles of others unless they ultimately

react upon themselves, and this has been kept clearly in mind in the information service which the bureaus maintain. The bureaus also furnish public spreakers for lectures, educational work, broadcasting., etc, and supply films, lantern slides, and data to meet any call for information regarding the public utility business. These district agencies are further supplemented by national organizations, including the Society for Electrical Development and other privately supported agencies. The increasing understanding by the public of the policies and problems of the utilities is evidenced by the thousands of columns of editorials, news, and financial items regarding them which are annually printed in newspapers and periodicals in the United States.

Details of Publicity Programs

It is now in order to consider more specifically the scope and the character of the information with reference to public utility affairs which should be furnished through general or local agencies. It is of the greatest importance that there should be public appreciation of the mutuality of interest between public utilities and the communities served. The old attitude of antagonism still survives in too many cases, fostered by political or personal interests or failure to understand the fundamental principles which now control public utility service. It has been pointed out that a public utility is a public servant, and that it works for a fixed wage or at least one variable within quite narrow limits, the real profits from its operations and development accruing to the communities served through reductions in rates and improved service.

Character of Service.—The general public should understand that public utilities stand ready to furnish any range or character of service within the scope of their authorizations which their patrons are willing to pay for, but that a few prospective patrons should not call for exceptional expenditures or abnormal service costs at the expense of existing patrons unless the latter are willing to assume the burden. Nor should the patrons of a public utility assume obligations which have no relation to the service which they receive, such obligations being considered in Chap. XI, which discusses taxation, paving requirements, etc.

Regulation.—The public should also be brought to understand that the fundamental purpose of regulation is so to adjust the

operations and rates of public utilities as to give satisfactory service to patrons and a fair return to the investors in the properties. It follows that public utilities, although naturally monopolistic in their operations, are deprived of opportunity otherwise offered in the absence of competition to secure excessive incomes, at least if their customers or the commissions having jurisdiction are sufficiently interested to take the necessary preventive steps. Such steps have, in fact, been taken freely, with the result that the returns earned by public utilities are in general substantially lower, although more stable, than those found in competitive industries. Regulation has decreased rates where they were too high and increased them where they were too low, in each case to consistency with the cost of the service rendered.

Trusts.—Because of the stabilizing effect of regulation, the so-called trusts, which certain people profess to look upon as a menace to the prosperity of the country through their vast aggregations of capital, are not to be feared but, rather, encouraged because of the economies in operation and capital expenditures which they make possible. There is still lacking complete regulatory machinery for handling interstate operations, but the powers of the Interstate Commerce Commission and the Federal Power Commission, and the jurisdiction of the state commissions over products sold within the several states, although possibly produced in others, all operate to prevent any extended abuse through holding companies, so-called superpower projects, or otherwise. As to the relative merits of federal and state supervision of utility activities in more than one state, it is the opinion of competent federal officials, as well as state executives, that the functions of state regulatory bodies should be extended as far as possible, reserving federal regulation to meet any clearly demonstated deficiencies in existing machinery which lack local remedies.

Rates.—The public should also understand that regulation prevents inconsistencies in rates and other discriminations which existed in the earlier operations of public utilities. There need no longer be suspicion that one customer is being favored with special rates or a particular kind of service over any other similar customer. This is true not only of individual customers but also of classes, although not to the same extent because of a general feeling that small customers should be favored over large ones as far as practicable without imposing excessive

burdens. The wisdom of this practice on any large scale may be open to question.

Capitalization.—Utility information activities should also correct misconceptions involved in the popular belief in overcapitalization. Many of the older public utilities were capitalized materially in excess of the actual money put into their properties, but this was done in accordance with the prevailing practice of the times, and such capitalization under regulation has no effect upon the rates which the customers of these utilities are required to pay. These rates yield only a fair return upon the *value* of the property devoted to public service, this value properly including services, property, or rights not paid for in money. Any so-called "water" in capitalization, therefore, has no bearing upon rates or service.

It is becoming more apparent that much of the assumed excessive capitalization of public utilities really represents value. This is perhaps best illustrated by the results so far available from the federal valuation of railroads, the capitalization of which has been more subject to attack than that of any other class of public service. The federal valuations so far completed disclose, in general, fair values substantially equal to the capitalization of the roads, and these findings of value give no material recognition to appreciation due to higher prevailing price levels.

Value of Service.—The public also needs to be reminded that public utility service is worth much more than it costs to the great majority of customers. Few of them stop to think of the dependability and convenience which characterize such service. The pressure of a button at any time of day or night sets in motion a silent service which can be adapted to a wide variety of functions at surprisingly low cost. The consistent improvement in quality of service and increase in quantity which can be secured for a given payment are also noteworthy. It has already been pointed out that electric companies are furnishing more than ten times as much light for a given charge as was possible in the early days of the industry, and that the rates are lower on the average than ever before in spite of the advance of more than 50 per cent in the average of other items entering into the cost of living.

It is true that the charges for other classes of public utility service have been increased in recent years, but in such cases

there has been at least a proportional increase in scope or value of service. The value of telephone service, for example, is largely dependent upon the number of other subscribers a particular subscriber can reach. During the last ten years this number has increased more than 100 per cent, but has been accompanied by only comparatively small increases in charges.

In spite of its value and indispensability, public utility service plays a very small part in the domestic and industrial budget. The average family spends less than 5 per cent of its total cost of living for electric, gas, communication, and transportation service. These figures should indicate the lack of good judgment in controversies over moderate increases in rates for public utility service when such increases are needed to insure the successful functioning and expansion of the business.

PUBLIC CONTACT

The above outline covers the more important features of the publicity service which have been undertaken for the public service industry. It is necessary to supplement it by local activities which cannot be embodied in printed matter. Personal contact is needed to bring utilities and their patrons into more sympathetic relations. Such activities may be described as "humanizing" the service. They include, among other things, an open door to the offices of executives, the removal of formidable grillwork from cashiers' cages and other places where it imposes a barrier between individuals, and the establishment of convenient booths where detailed information regarding the company's business, inquiries regarding new service, and other matters will have prompt and intelligent attention.

PERSONNEL

Public utilities are also paying attention to the selection of their telephone operators, whose business it is to direct calls to proper departments, this position requiring special alertness, courtesy, and cheerfulness—all of which tend to reflect the general policies of the organization. Not only telephone operators but all other employees are being trained in uniform habits of friendliness and thoughtfulness in all their contact with the public.

It is this contact that establishes the character of a utility in the minds of its patrons. The contact of a large electric company with its customers is very largely through its meter readers.

It is not unusual in these days to find on the route cards of meter readers of a progressive electric company reminders to inquire regarding some member of the customer's family who was ill when he previously called, or whether certain reported service difficulties have been adjusted. A number of electric and gas companies are trying with success a plan of dividing their territory into a suitable number of districts, each having a carefully selected representative responsible for all direct contact with the customers therein. This includes meter reading, collections, attention to service troubles, solicitation of new business, and other functions which tend to develop a friendly and even intimate relationship between customers and the company of which this representative is the personification.

Conductors on street cars may create favorable impressions by cheerful greetings, assisting elderly people and children on and off the cars, and otherwise showing appreciation of patronage which might be diverted to automobiles or elsewhere. It is not often realized that these employees not only produce service but also advertise it, sell it, and collect payment therefor—a unique grouping of functions.

ALERTNESS

Progressive electric companies are also seeking favorable impressions from new customers by a policy of furnishing service on premises accessible to existing lines on the same day that application therefor is received. This requires the waiving of the formalities of signed contracts, prolonged investigation of credit of the prospective customers, and the obtaining of deposits as security for future bills before any further steps are taken to establish service. Most of these formalities are not encountered in other business dealings.

Customers' deposits are now explained as a protection of good customers, rather than of the company, from other customers who fail to pay their bills, losses from such source being a recognized part of the cost of service to be covered by rates. Formidable service rules and regulations are gradually being superseded by the uniform service requirements prescribed by the commissions.

MERCHANDISING METHODS

Electric railways are also taking energetic steps to make their service more attractive through merchandising methods, common

in other business but not previously used by them, in an effort to attract back to the street cars some of the patronage which automobiles have taken away. Advertisements on the cars and in the newspapers to the effect that street railway patrons have no parking problems or garage fees, that all street cars have four-wheel brakes, etc., tend not only to increase patronage but to improve the relations between the company and the public.

POLITICAL FREEDOM

Public utilities are also seeing the wisdom of complete avoidance of political affiliations and entanglements. When it is remembered that the public is being served at cost, the occasion for special favors from public officials disappears and every official and employee of a public utility should be free to act and vote on political issues in any way he pleases.

EMPLOYEE EDUCATION

Reference has been made to education of employees in the line of their several duties. Such education has been developed on a very large scale under the auspices of the national organizations, state departments of education, and special courses in technical schools. These courses are provided for accountants, engineers, metermen, mechanics, linemen, trackmen, station operators, and other classes to whom education would bring opportunities for greater efficiency, advancement, and more helpful contact with the public.

Courses have also been conducted, usually for more advanced employees, in the economic phases of the industry in order that they might have a clearer and more balanced picture of administrative and public relations problems and be able intelligently to discuss them with people inclined to be critical of existing policies or methods.

PUBLIC EDUCATION

Educational plans have not stopped here. They include courses in universities in the broader problems of public utilities and the training of executives and public officials for future usefulness. Outlines of prospective courses and more specific plans, including special textbooks, have been prepared—all to the end that an increasing number of citizens, whether or not

directly interested in public utility affairs, may have a correct appreciation of their problems and the economic principles which should govern in their solution. Existing textbooks, particularly those on economic subjects, are also being carefully studied to discover those which, through ignorance or prejudice of the authors, have inaccurately presented the controlling principles in modern business activities. The importance of correct fundamentals in educational courses cannot be over-emphasized, and many textbooks are clearly deficient in their analysis and perspectives of facts and principles.

CUSTOMER OWNERSHIP

Reference should here be made to another very important factor in establishing satisfactory public relations, which has been given further consideration in the preceding chapter, namely, customer ownership. Nothing tends more strongly toward the establishment of friendly business relations than a direct financial interest. This has led many companies to sell shares in the ownership of their properties as widely as possible among their customers. In certain cases customers have been urged to invest sufficient amounts in the companies which they patronize to yield a return that will pay their service bills. Under such a program, the home ownership and control and the natural pride associated therewith are helpful in avoiding uncalled-for agitation over rates and service of public utilities. Local political or other agitators hesitate to denounce an enterprise in which a substantial number of their friends or constituents are interested. Many illustrations might be given of the interest and cooperation which customer ownership brings about, including reports of linemen loafing on the job in a customer's neighborhood, criticism of wasteful lighting of company premises, and opposition to burdensome taxes.

A further advantage of customer ownership which has not yet been utilized to any considerable extent but which involves attractive possibilities suggests itself. One of the annoying and expensive incidents of public utility business is the monthly reading of customers' meters, computing and rendering bills, and making collections, particularly for small customers, who ordinarily constitute 80 per cent or more of the total number. At times the expense attached to these motions alone exceeds the entire revenue derived from the service.

If such customers could be persuaded to purchase securities of the company, the normal income from which would be approximately equal to the current bills for service, the routine of monthly meter reading and billing might be avoided. As a substitute, meters might be read and accumulated bills computed in connection with quarterly or semiannual distribution of interest or dividends, and adjustment made by paying to the customer any excess due over the concurrent cost of service or collecting from him any deficiencies. Suitable accounting machinery could be devised for monthly accruals of revenue on the one hand and interest or dividends on the other hand This plan would require some increases in working capital even in the case of quarterly settlements, but the feeling on the part of the customer that he owned the facilities required for his service, and the simplicity of the occasional accounting settlement, would result in a substantial improvement in public relations.

MUTUAL CONFIDENCE

Through such means as above outlined the utilities are establishing not only friendly but intimate contacts with their customers and neighbors, and getting rid of many of the controversies over franchises, rates, and service which have not only been expensive but have distracted the attention of executives from their more logical and helpful duties.

References to Supplementary Reading

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CHAPTER XVI

SOME CURRENT UTILITY PROBLEMS

The foregoing chapters have discussed a wide range of factors involved in the financing, construction, and administration of public utilities. This discussion has involved certain generally accepted economic principles, none of which is peculiar to the public utility field. Their application thereto has not, however, always been obvious, or has frequently been ignored by students of utility problems. It is the purpose of this chapter to illustrate the application of some of these principles to certain important problems which confront the industry. A final satisfactory solution of some of these problems is wanting; in other cases decisions have been made more or less arbitrarily which, under analysis, would show varying degrees of consistency with the principles in question. It is impossible to consider in detail any large number of problems, and so a few have been selected which are both important and representative.

PROPERTY EXTENSIONS

Utilities are constantly subject to requests for extensions of their lines, mains, or track into outlying and often sparsely settled territory. Some of these extensions are logically required to take care of the steady growth and expansion of the communities, whereas others are more remotely located and unrelated to community development. Before taking up details of specific cases it should be pointed out that public utilities assume an obligation to render adequate service within the territory reasonably accessible to their facilities. This does not mean that only those patrons who are immediately adjacent to existing lines are entitled to service, but these lines must be extended for reasonable distances in keeping with community expansion.

The problem, therefore, centers around a definition of what constitutes a reasonable expenditure for extensions. Long and expensive extensions serving only a few people, which are of no

benefit to the community as a whole and which will not for a long time yield sufficient revenue to cover the full cost of service, should ordinarily not be built if they would add to the cost of serving existing customers or cause the return to the owners of the property to fall below a reasonable limit. On the other hand, a normal utility should expect to maintain a standard of rates which will permit temporarily unprofitable extensions to its property from time to time when the burden of these extensions, distributed over the business as a whole, is small.

Electric Line Extensions.—The above general statements are of little value in the solution of specific extension problems. In such problems the cost of the extension and its initial revenue are first estimated, and the adequacy of the revenue to support the investment without undue aid from existing business is in question. The author has undertaken to prepare a general analytical solution of this question based on certain relations developed in a preceding chapter, and to apply it to a normal electric property. An extension is defined to include only line construction and not customers' meters, services, transformers, or other equipment, assumed to be uniform per customer regardless of location.

It will be recalled that a formula in Chap. XII expressed the relation between total investment (I) and annual earnings (E) of the business (called investment ratio) in terms of the operating ratio (R), as follows:

$$\frac{I}{E} = \frac{100 - R}{10}.$$

Any new business which increases operating expenses, taxes, and carrying charges (interest, dividends, and retirements), all in the same ratio as prevailed on previous business, should obviously have the same relation between the total investment assignable to it and the annual revenue derived from it, if this new business is to be equally profitable.

As a matter of fact, operating expenses do not immediately increase in full proportion. There is full increase in fuel, supplies, and some other items, but wages, maintenance, and administrative costs lag behind for an appreciable time before expansion is necessary. Viewing the immediate situation, therefore, the general formula above stated may be modified to the extent of recognizing only increment expenses in the operating ratio.

If these expenses are assumed to be 75 per cent of the full expenses, the formula temporarily applicable to extensions becomes:

$$\frac{I}{E} = \frac{100 - 0.75R}{10}.$$

Such a modification operates to increase materially the investment which may be made per dollar of earnings.

If the suggested correction of 0.75 for reduced expenses is applied, for example, to a 60 per cent operating ratio, the value of $\frac{I}{E}$ becomes 5.5, or \$5.50 for each dollar of earnings. But this does not give the answer sought because I is the total investment involved, including existing property to be utilized as well as the extension. In accordance with standards developed in Chap. XIII, it is assumed that the total investment in an electric utility is roughly distributed as follows:

50 per cent in power-production facilities.
25 per cent in distribution lines.
25 per cent in transformers, services, meters, and miscellaneous.

The distribution investment may be again divided between (1) trunk lines, and (2) other lines which are extensions of the trunk system or were originally extensions but have gradually developed normal load density. It may be roughly assumed that something less than 50 per cent of the distribution total, or about 10 per cent of the entire investment, is in the latter group, which is involved to only a limited extent, if at all, in new extensions. Any business added through new extensions will, therefore, utilize only about 90 per cent of the total previous investment, in addition to the new investment necessary in the extension itself.

Assuming that existing investment is used to the extent of 90 per cent of its total, as suggested above, the required amount of new investment can be determined, because this illustration deals with a normal property with a stated relation between investment ratio and operating ratio. A 60 per cent operating ratio permits a total investment per dollar of revenue of \$4, of which 90 per cent, or \$3.60, is used for the extension. The permissible investment in the extension itself is the difference between the total investment applicable to it (\$5.50) and the \$3.60 of prior investment used, or \$1.90. The ratio of investment (i) to reve-

nues (e) of the extension may, therefore, be tentatively expressed by the following formula:

$$\frac{i}{e} = \frac{100 - 0.75R}{10} - 0.9\,\frac{I}{E}.$$

Application of this formula will show that variations in operating ratio, affecting both old and new investments, have a comparatively small effect upon the permissible new investment, the tendency being slightly to increase the amount with increase in operating ratio.

But these are not the only factors needing attention. Normal companies have, most of the time, substantial margins of generating and distribution line capacity supported by existing business, which can be used temporarily for new business without increase in carrying charges. So long as such use is permissible the general formula may be further modified by reducing the amount of prior investment chargeable to the extension—a second reduction in $\frac{I}{E}$.

A general formula may now be considered for the determination of the permissible additional investment in extensions per dollar of their annual revenue, in which formula any appropriate modifications may be made in factors representing (1) reduction in operating ratio, (2) the extent of regular use of previously existing facilities, and (3) the extent of temporary use of reserve capacity. These three factors are represented by K_1, K_2, and K_3 in the following formula:

$$\frac{i}{e} = \frac{100 - K_1R}{10} - K_2K_3\,\frac{I}{E}.$$

The value of these factors in any particular case may be substantially different from those tentatively assumed above. K_1, which fixes the increment operating ratio representing added expenses immediately incurred for the new business, depends upon the size and the character of the business in prospect, the adequacy of the existing operating staff, and liberality in property upkeep.

The value of K_2 is reduced from unity only to the extent that the existing distribution system and other facilities are not utilized for the proposed service. If an entirely independent line were constructed from the power station to the new territory to be served, the value of K_2 would be reduced by an amount equal

to the ratio of the entire existing distribution system investment to the total investment, which may be in the vicinity of 25 per cent. The value of K_3, depending upon reserve capacity available in power stations and lines, may vary between wide limits, but where existing facilities are practically loaded throughout it approaches unity.

Furthermore, if the cost of services, transformers, and meters required for customers on the extension in question is not consistent with average requirements, they may be included in the cost of the extension. The existing investment would then be correspondingly curtailed by a reduction in the factor K_2 to a point where the remaining investment would include only power supply, the joint feeder and main system, and office and other general facilities. This modification of the formula may yield more accurate results because the new services may be longer and transformer capacity greater than the general average.

Factors K_1 and K_3, representing temporary savings in operating cost and investment, should also be influenced by the promptness with which additional business can be secured to supplement the immediate new business for which extensions are built. If the prospects of growth are poor or remote, these factors should be appropriately adjusted toward unity so that the new business will not be unduly favored. There is, however, always the possibility of permanent improvement in the operating ratio R, due to new business, and this may have recognition either in K or by adjusting R itself.

As already indicated, the extent of investment per dollar of annual revenue from extensions, determined by solution of the above formula, has a considerable range depending upon local conditions. It is the practice of various electric companies that have given this subject attention, but perhaps not careful analysis, to follow a general rule under which $2 may be spent in extensions for each dollar of initial annual revenue therefrom. Trial solutions of the proposed formula will show that this result is reached with liberal deductions from the operating ratio through the factor K_1, and using unity values of the factors K_2 and K_3, or by smaller reductions in the value of all three factors below unity. The practice of these companies under normal operating conditions should, therefore, be considered reasonably conservative. If liberal reserve capacity is habitually maintained, and operating conditions are favorable, the formula

shows that expenditures for extensions may safely be increased beyond the conventional \$2 limit.

An examination of the general formula for extensions will show that it provides an automatic check upon repetition of past errors or extravagance. If the property has been overdeveloped or unwisely extended, the permissible investment in extensions is curtailed through the high value of the second member of the formula, involving $\frac{I}{E}$, which is a deduction from the total investment applicable to the new business. Furthermore, to the extent that existing business is unprofitable, the increase in the factor R in the formula tends to curtail the permissible new investment unless conditions are such that K_1 can be reduced substantially below unity.

Gas Mains.—The problem of gas main extensions differs somewhat from that of electric line extensions in that the distribution system investment of a gas company is a somewhat larger proportion of its total investment and the unit cost of main extensions of size sufficient to provide for growth is also greater.

With suitable allowance, however, for these variables, the general method of analysis outlined above may still be applied. Through analysis, or arbitrarily, many gas companies have established rules for extensions under which 100 feet of main or thereabouts will be run for each prospective customer. Such extensions cost about \$100 and yield average annual revenues of \$45; so this rule is not inconsistent with similar arbitrary rules for electric extensions or with the formula stated herein.

Rural Lines.—The problem of rural electric line extensions has been given much thought in recent years. Such lines include those running for long distances through sparsely settled sections to furnish light and power service for farm and other operations. Only about 250,000 of the 6,500,000 farms in the United States have so far been reached with electric service. Obviously, the electric companies cannot furnish service at normal rates over such long lines, built at their own expense, because the extensions alone for typical farm service cost at least as much as the entire investment needed to serve an equivalent urban customer.

Regulatory commissions and utility and farmer organizations have developed a number of methods under which such needed service may be handled. The simplest method is to charge the users of the lines with the excess of construction cost over that

in developed areas, this excess cost to be apportioned among the customers on the basis of their use, with rebates within certain time limits if added customers are secured and assume their proportion of the original investment.[1] Under such circumstances rural service may be rendered at rates approximating those in the cities with a moderate service charge to cover the extra cost of meter reading, servicing, line maintenance, transformer losses, etc. Transformer losses alone on rural lines, requiring separate installations for each customer, are estimated to be ten times as great per customer as for urban service.

Another method is to assess upon the users of the rural extensions a charge, supplementary to the regular rate, sufficient to cover the added service cost and carrying charges on the investment in the extension.[2] This does not protect the utility from possible loss of business on the extension through removal of customers or discontinuance of service for other reasons. Still another but more complicated plan prescribed by one of the commissions provides that an estimate be made of the revenues, expenses, carrying charges, and cumulative deficits up to the time the extension becomes profitable.[3] Such deficits are advanced by the prospective customers, and the line is built and operated at the expense of the utility. It should be noted that plans which do not directly charge the farmers with all line extension costs have an advantage in that more funds are thereby available for investment in power-using appliances.

All these methods seek to place the burden of cost of service in areas not accessible to existing lines upon the users rather than to distribute it over existing business. Experience on experimental rural lines and elsewhere, which is being carefully studied, indicates that the service is worth what it costs, at least when advantage is taken of a reasonable range of labor- and time-saving equipment, including that for pumping, threshing, milling, milking, refrigeration, and cooking.

Railway Tracks.—The difficulties of determining the profitableness of track extensions of electric railways are even greater than in the previously mentioned utilities because of the large investment involved and the uncertainties of future revenues, due to population drifts and the use of automobiles. Compara-

[1] Wisconsin: *Proc. Nat. Elec. Light Assn.*, 1922, vol. 1, p. 111.
[2] Indiana: *Proc. Nat. Elec. Light Assn.*, 1922, vol. 1, p. 122.
[3] Washington: Regulations, effective Jan. 1, 1923.

tively few railway extensions have been made in recent years, due in part to scant revenues from existing business and the necessity of large initial patronage to make an investment in extensions even approximately self-supporting. Many railways have adopted bus service in place of track extensions because of the readiness with which such service can be adjusted to traffic or the facilities transferred from one district to another.

The insistent demands of real estate promoters for extensions into outlying districts which they hope to develop have always been embarrassing to railway companies because of political influences or threats of competition. Satisfactory solutions of these problems have been effected in various cases based upon the expressed convictions of the promoters that their projects would promptly develop a large and profitable volume of traffic. The promoters have been told that the railways would make the necessary track extensions and furnish the other necessary facilities at the expense of the promoters, and would operate the extension as an adjunct to the existing railway system, also at the expense of the promoter—all the revenues and alleged profits to belong to him.

Where the real prospects of traffic have been favorable, the railways have agreed to assume the burdens of operation, provided the promoter would furnish or lease the facilities, the railways reserving the right to purchase the facilities from the promoter if or when the volume of business justifies. A well-conceived real estate development should yield a sufficient profit to its promoters, through appreciation in real estate values, resulting in substantial part from convenient transportation and other public utility service, to justify the promoter in assuming the early losses from the operation of the service. Increases in land values from $50 per acre to $50 per front foot have been observed as the result of street railway extensions. Clearly, there is no reason why either the railway or its regular patrons should bear the losses from such extensions in order that real estate profits may be enhanced.

The above principle of assessment upon real estate as a partial offset to enhancement in values due to utility service, has recently had recognition in connection with rapid transit lines. It is well known that the construction of such lines is much more effective than surface lines in making suburban property more accessible to business centers, and adds correspondingly to its

market value. The Detroit plan of real estate assessments for a subway system as a part of its municipal railway, referred to in Chap. XIV, was decisively endorsed by popular vote in 1924. The assessments are carefully graded in proportion to the proximity of the real estate to the proposed lines and to the corresponding benefit to be derived from them.[1]

The city of New York is also proposing to remove certain elevated railway structures which have a pronounced depressing effect upon neighboring real estate values, and to substitute subway lines which would enhance such values. A similar plan of real estate assessment has been suggested but not yet worked out in detail. Abutting property owners have expressed a willingness to accept a 10 per cent assessment as a contribution to the cost of the change (about 50 per cent of the estimated total cost). Such plans are simplified by municipal ownership of rapid transit facilities, however they may be operated, but the application of the same principles to privately owned lines, either rapid transit or surface, is by no means impossible.

COORDINATION OF LOCAL TRANSPORTATION

The statement was made above that relatively few extensions of railway property have been made in recent years because of scant existing revenues, due in part to increasing competition from motor vehicles. The registration of motor vehicles in the United States at the end of 1924 was more than 17,500,000, of which 90 per cent had been added during the preceding ten years. Engineers connected with both railway and automotive industries have estimated that the saturation point in motor passenger vehicles is not far away because the present registration provides a vehicle for nearly three out of every four existing families.

If these estimates are even approximately correct, the railway industry has passed the critical period of competition from private automobiles with a gain in per capita riding for the industry as a whole throughout the period. The extreme traffic congestion now existing in large cities and the increasing corrective measures, including parking restrictions, one-way streets, and other traffic regulations which are having intensive study, all tend to discourage unnecessary use of private automobiles

[1] *Aera*, January, 1924, p. 994.

and to divert traffic back to electric railways. This drift is not yet pronounced in moderate- or small-sized cities, but some of these cities are copying the traffic restrictions of their larger neighbors. So the problem of competition from private vehicles may be considered as less vital for the future than it has been in recent years.

Jitneys.—The problem of competition from commercial motor vehicles has not yet been solved. It had its origin in 1914 when the so-called "jitney" suddenly appeared on the Pacific Coast and gradually swept its way across the country, invading a majority of the larger cities and many small ones, taking the cream of the traffic, and playing havoc with railway incomes. Initially a product of unemployment, the jitney was never a financial success to its individual owners when interest and depreciation were considered, as evidenced by frequent changes in operating personnel. It was economically unsound because of its waste of man power and other resources in excessively small units without compensating advantages. Under improved economic conditions the original jitneys, usually second-hand low-priced touring cars, gradually decreased in number and scope of operation until now comparatively few remain. The retirement was accelerated by municipal or state commission regulations which recognized the impossibility of maintaining such service in competition with a self-supporting and efficient railway service.[1]

Buses.—The jitney problem has, however, been succeeded by a bus problem, and bus service is now being conducted on a fairly large scale in a number of cities, using specially constructed vehicles seating from twenty to thirty or more passengers and operated by financially responsible companies. Such organized, efficient, competitive service is menacing the operations of a considerable number of railways in communities where effective regulatory machinery has not yet been developed. The bus has advantages in its ability to change its routing and otherwise adjust itself to traffic conditions without the rail restrictions applicable to railways. The railways have not been unmindful of these advantages and have themselves inaugurated bus service on a substantial and rapidly increasing scale. At the beginning of 1925 about 2,660 buses were being operated by 171

[1] Nash, L. R., "History and Economics of the Jitney," *Stone & Webster Jour.*, May, 1916.

railways over nearly 4,300 route-miles.[1] Such service has usually been operated as a feeder to existing rail service, but in some cases supplementary through routes have been established on streets not having tracks. The relative economies of rail and railless transportation are now receiving most careful attention.

The railways are strongly urging that they should not be subject to competition but should assume the sole obligation of furnishing adequate urban transportation in whatever forms may be appropriate and economical or which may be demanded by a traveling public that is willing to pay the cost. The logic of this contention has been recognized outside the railway industry by many city officials, traffic experts, chambers of commerce, and by practically all the regulatory commissions. An extended summary of commission views was published in *Aera* of December, 1920. Such of the commissions as have the necessary authority have prevented indiscriminate competition, and where railway companies have offered bus service coincident with independent applications for permits for such service, the required certificates have usually been granted to the railway companies.

This procedure is consistent with the fundamental economic principles which this book has undertaken to set forth. Coordination of public service means higher efficiency and less cost than competition can offer, and this is fully as true of transportation as of other classes of service in which such factors as transfer privileges are not involved. The ideal urban transportation system should include rapid transit lines for mass transportation (where justified), rail lines for fairly heavy traffic movements, and bus lines for suburban and other light traffic—all coordinated for simple interchange from one system to another. It may be that the taxi-cab service of the future will be made a part of such a transportation system, although such transportation involves exclusive service features not found in the other classes of transportation considered.

Certain enthusiasts have looked upon the bus as a successor rather than an adjunct to rail transportation. A number of fairly large cities have tried the experiment of depending wholly upon bus service after railway service had been discontinued because it no longer could survive the existing bus competition.

[1] *Aera*, February, 1925, p. 1170.

Such experiments were tried, for example, in Toledo, Bridgeport, Akron, Des Moines, and Saginaw. In all these cases, involving cities of only moderate size, the results showed clearly the impossibility of furnishing adequate transportation with buses, and the inadequate service which was rendered caused disorganization of business and intolerable congestion upon busy streets.

The average street space occupied by even large buses is appreciably greater per passenger than that of street cars, and the ordinary private automobile occupies more than ten times as much street space per passenger as the street car. Street cars in fairly large cities carry four times as many passengers as all other vehicles combined, but they constitute only about one-tenth of the total number of vehicles using the streets. Aside from all other considerations, therefore, that of economy in street space should be an important factor in the transportation problem.

Interurban Lines.—Interurban railways, to say nothing of railroads, are also being seriously affected by motor vehicle competition for both passengers and freight. There is less opportunity in this field for coordination, and the possibilities of effective regulation by local authorities over service which crosses state boundaries have been restricted by recent decisions of the United States Supreme Court denying supervision by state authorities over such commerce.[1] As pointed out in another chapter, one of the remedies helpful to existing rail transportation would be the assessment upon all highway traffic of the costs, suitably apportioned, of highway upkeep. In this way discrimination against carriers which own and maintain their own highways would in part be avoided.

There is no reason why existing interurban railways should not establish branch bus lines or connecting links, or make through traffic agreements with non-competing independent bus lines with convenient joint terminal facilities to bring about a measure of coordination consistent with that recommended for city service, and progress in this direction is being made. Steam railroads, as well as interurbans, may also meet truck competition by offering an equally complete and convenient service. This means store-door collection and delivery which is now under trial and will probably be adopted on an extended

[1] *Buck vs. Kuykendall; Bush vs. Malloy,* decided Mar. 2, 1925.

scale. Incidentally, it would tend to reduce traffic congestion by greater coordination of trucking service.[1]

LABOR-SAVING DEVICES

It has been pointed out in earlier chapters that public utilities are carrying on their business at rates lower in relation to other commodity and service costs than was the case before the World War. Average light and power rates are actually lower than they were ten years ago, and the increases in rates of railway, gas, and other forms of public service have been to a relatively moderate extent.

This situation has been made possible largely through the increasing use of labor-saving devices. Such devices have been the natural outcome of wage increases, amounting on the average to something like 100 per cent. Human ingenuity is always at work developing methods of production by machinery which are quicker and less expensive than the work of human hands, and every substantial increase in wages brings up anew the problem of balancing the carrying charges on labor-saving facilities against alternative labor costs.

Within the last ten years the railway industry has revolutionized its operations and saved itself from more serious financial difficulties by developing one-man car operation on a large scale through the use of safety devices which avoid the former risks attending such operation. If the operator suddenly becomes disabled, the modern one-man car will promptly stop itself by shutting off the current, applying air brakes, and sanding the rails, and will release its doors for discharge of passengers. A large number of companies, some of them in fairly large cities, are operating 100 per cent one-man service. One-eighth of the passenger cars reported in the 1922 census were of the one-man type, and more than one-half of those subsequently purchased have been equipped for one-man or one-two-man operation.

Railway companies are also using automatic substations containing rotary apparatus for converting high-voltage alternating current into direct current for the cars. These substations start and stop themselves with change in load conditions,

[1] ANDERSON, HON. GEO. W., "Roads—Motor and Rail," *Aera*, May, 1925, p. 1678.

and perform other intricate functions to take care of any recurring operating phenomena—all without human assistance. Automatic track switches, prepayment turnstiles, and many other similar devices have been introduced to take the place of higher cost labor, with the resulting savings already noted.

Electric and gas companies employ proportionately less man power and have made their gains largely through increases in size of equipment, requiring less labor attention per unit of capacity. Electric companies, however, are using not only automatic substations but also automatic power stations of the small hydroelectric class. Telephone companies are introducing as rapidly as possible machine switching to take the place of the many operators now required for subscribers' connections, thereby bringing about precision of service as well as insuring against interruption from labor disturbances. Public utilities are in the rather anomalous position of being under obligation to furnish continuous public service without any corresponding obligation extending to their employees, who may leave their jobs singly or collectively without legal restraint. Under such circumstances the liberal use of mechanical substitutes for manual labor is a logical step to insure fulfilment of obligations to the public.

POWER FACTOR

A preceding chapter has considered the question of power factor in its relation to rate schedules for wholesale power service, but mentioned only briefly the broader economic aspects of the subject. Much has been written about power factor from engineering and commercial viewpoints, but the seriousness of the problem has not been appreciated by the average utility executive who looks upon low power factor as one of the burdens of the business which, although involving large capital expenditures and appreciable operating costs, cannot be avoided.

It has been pointed out that low power factor is caused by wattless current used for magnetizing motors and other service facilities. This wattless current passes through the customers' watt-hour meters without registration. A customer using synchronous motors provides his own magnetizing current from a separate exciter, the power for which is registered on his meter and, therefore, paid for. By simple adjustments of excitation, the power factor of such motors may be brought up to unity

or made "leading" to correct for "lagging" conditions elsewhere. There is an obvious discrimination in furnishing magnetizing current free to one customer and requiring another customer to pay for it. This discrimination may be avoided through the rate differentials described in Chap. X, but it is by no means clear that this is the best solution of the problem from an economic viewpoint.

The average power customer has no conception of the meaning of power factor and its effect upon service costs. He resents a penalty for low power factor because it represents an intangible something over which he thinks he has no control. As a matter of fact, customer power factor may be increased within wide limits through careful fitting of motor capacity to work required and other adjustments that not only involve no material cost to the customer but tend to reduce his equipment cost. It may further be controlled by special types of motors, rotary or static condensers, and other means that do involve added investment. The customer naturally will not assume such investment unless he sees compensating advantages.

The extent to which customers should be called upon to invest in power-factor correction devices in order that the electric company furnishing the power may curtail its otherwise necessary investment is an engineering problem that has so far been solved in only a few special cases. Studies which the author has made indicate that a power company may reduce its charges for high power-factor service below those for low power-factor service to a sufficient extent more than to offset the carrying charges on the customer's additional investment and still show a saving for itself through reduction in investment necessary to serve such a customer and through lower operating cost.

There are other ways of bringing about the same result than through rate adjustments. If a customer objected to making the additional investment necessary to secure high power factor, the power company might advance the excess of such cost over that of the more common low power-factor equipment which the motor salesmen are apt to offer, the advance being recovered through instalment payments or through withholding for a suitable period a reduction in demand charge to which the customer would otherwise be entitled because of his high power factor. These or any other methods of power-factor correction assume that it is cheaper to furnish magnetizing current on the

customer's premises than it is to produce it at the central station and deliver it to the customer, as has been generally done in the past.

Utility executives who have given this matter careful thought are of the opinion that it is one of the most important problems which the electric industry has to solve. It requires further careful engineering study to determine the relative cost under different circumstances of furnishing magnetizing power at the source of power and the point of utilization. There is need also of further education of customers regarding power factor and its effect upon service cost and the methods whereby power factor may be increased with attendant reduction in cost of service.

The author urges upon the electric industry an exhaustive study of all phases of the power-factor problem with a view to working out a program under which the total combined investment in power production and utilization facilities may be reduced. This would, of course, mean a reduction in the total cost of power service.

STREET LIGHTING

Except for its engineering phases the subject of street lighting has been given comparatively little careful attention. The negotiation of contracts for such service has usually been a matter of trading between utility and city officials, with results sometimes inconsistent with the cost of the service or with some business principles which should have recognition.

Street-lighting contracts are commonly written for a term of from five to ten years, this term having no definite relation to the total or remaining useful life of the special equipment involved. Under such conditions and with recurrent changes in types of street lighting, it is the natural desire of electric companies, when making a contract covering a new type of equipment, to secure rates high enough to amortize a large part, if not the whole, of the investment in special equipment during the life of the agreement. This is a logical protective measure if the company has no definite assurance of a renewal of the contract upon its expiration, even if the useful life of the facilities may be substantially longer than the contract term or if there is reasonable expectation of renewal.

Such short-term amortization of investment in standard equipment is extravagant and should be avoided unless there is reason to expect such material changes in the street-lighting art that further use of existing equipment will be improbable. This situation is in part analagous to that considered in Chap. III in connection with term franchises, where excessive amortization and inability to make extensions toward the end of the franchise period are encountered.

It would, therefore, seem logical to adopt for street lighting an indeterminate form of contract similar to that which is coming into vogue for franchises. Under such an agreement a suitable street-lighting system would be provided and rates developed conditioned on the use of that system throughout its economic life. In other words, the system would be continued until it became antiquated or its abandonment was justified by the substitution of a more modern, efficient system.

If the city wished to terminate the street-lighting agreement prior to the expiration of the economic life of the equipment, which life was a factor in the fixing of the street-lighting rate, or wished to substitute another more suitable system, it could do so by payment of the remaining unamortized portion of the original investment with appropriate adjustment for salvage. Such payment might be made outright or spread over a period of succeeding years as a part of the current payments for the new service. In this way the city could indefinitely maintain a satisfactory and flexible street-lighting system without either overpayment or underpayment for amortization of special investment.

A few contracts of this kind already exist, some of them going into still further refinements with respect to operating costs, being, in effect, service-at-cost contracts. The complications and technicalities involved in such agreements are, however, large considering the amount of money which is specifically involved, and under stable operating conditions further refinements than those first proposed may not be justified. Fuel clauses may be appropriate in long-term contracts where substantial changes in fuel costs are anticipated, although, except in the larger sizes of street-lighting units, the fuel cost is a minor proportion of the total.

It is not unusual, in making or renewing a street-lighting contract, to have both parties involved compile an extended list

of rates paid in other cities for similar service, in an effort to justify or disprove the reasonableness of proposed rates. Such collections of rates are of little value because of their wide variations resulting from unusual service conditions or political or other influences leading to rates not comparable with those where conditions are normal. The opinion has frequently been expressed that street-lighting charges should be low as compared with those for other service because the city should be a favored customer and be aided in keeping its budget at the lowest possible point for the relief of taxpayers who are also utility customers. The final result as far as customers are concerned would be the same if tax bills and electric bills were all apportioned in the same way. This, however, is never the case, and small consumers who pay negligible taxes would have higher electric bills if rates for street lighting were so low that the deficiencies in fair return therefrom had to be made up from other business. The fairest procedure is to establish street-lighting rates upon the same basis, including the same return upon the investment utilized, as is used in other rate structures.

It is not unusual, in making estimates of street-lighting costs, to overlook or underestimate certain factors. They include supplies of fuel and other material necessary for the service, and possibly a material amount of working capital if the city is habitually dilatory in paying its bill, as occasionally happens. The power losses in conversion and distribution are also sometimes underestimated, particularly in the smaller-sized units. It must be remembered that, where units on series circuits are uniformly spaced, the line losses are uniform per unit, and these uniform losses are a much higher percentage of the useful power consumption with small lamps than with large ones. Careful computations for lamps of 100 candle power, on a circuit having 700 feet of wire per lamp have shown conversion and distribution losses amounting to more than 20 per cent of the lamp wattage, as compared with the conventional estimate of such losses of 10 per cent. The latter estimate is low even for units as large as 400 candle power.

There is much room for improvement in street illumination in the average American city. It has already been shown that such cities ordinarily spend not more than $1 per annum per capita for this purpose, this being something like 3 or 4 per cent of the total tax levy. Cities which have provided better street

illumination hold that the added expenditures are fully compensated for by reduction in disorder, crime, and accidents. Engineering studies indicate that adequate street illumination requires not less than 1 watt of lamp capacity per linear foot of street illuminated in residence districts, at least double this amount for mercantile districts, and 10 watts or more and per foot in the highest-grade business streets where lighting of the white-way type is required. It follows that units of less than 100 candle power are of little practical illuminating value unless spaced so close together that the installation cost is unduly increased.

After making many analyses of street-lighting costs, the author has found that the annual required revenue from series gas-filled tungsten lamps of the various sizes in common use can be approximately determined by a formula containing three factors: one varying with the rated capacity of the lamp, another with the kilowatt-hours consumed, and a third fixed factor independent of the size of the lamp or the extent of its use. The last named factor, which assumes fairly uniform spacing of lamps with such variations in candle power as the character of the streets requires, is a substantial part of the total cost. In small units it is such a large part of the total that, coupled with the relatively low efficiency of such units, the cost per candle-power year becomes so high as to make them undesirable, particularly when their very restricted illumination is considered. A study of normal consistent street-lighting rate schedules will show that the candle-power-year cost of 60-candle-power units is about three times that of 600-candle-power units.

White-way Lighting.—A few words may be appropriate regarding the conditions under which white-way lighting should be undertaken. Some progressive cities have installed such systems with underground connections and ornamental posts, and operated them wholly with public funds. Other cities have felt that such expenditures were not justified in the general public interest because the principal result of such lighting is to attract people to the streets so lighted, to the advantage of the merchants located thereon and to the disadvantage of stores on other streets. Such cities contend that white-way lighting, designed primarily to attract trade, should be paid for directly by those benefited.

As a result of these contrary views, many different forms of white-way contracts exist. In some cases the electric companies have furnished the entire installation under a long-term contract during which the abutting property owners or their tenants pay the cost of the service and the amortization of the special investment. In other cases the utilities have succeeded in making the installation at the expense of the property owners who have also assumed the current service charges. In still other cases the cities have assumed the cost of operation, after the installation has been paid for by the property owners, or at least that part of this cost equivalent to normal street lighting.

Difficulties have arisen in connection with the arrangements first described in that some of the property owners have failed after a time to meet their obligations and the remaining subscribers have been unwilling to assume them. The electric companies have, therefore, been obliged either to assume a part of the service cost themselves or to discontinue the lamps for which support has been withdrawn. The latter method detracts from the appearance of the system and naturally causes protest from neighboring subscribers who have continued to pay.

Studies which the author has made of such situations have led to the conclusion that white-way installations should not be financed by the electric companies because of the uncertainties surrounding the recovery of the investment, and also because ornamental and expensive street fixtures are in a way analogous to interior lighting fixtures which customers habitually furnish at their own expense. The electric companies may well serve as agents for any group of property owners who wish to install white-way lighting to the extent of making the installations at their expense. The companies may even assume a part of the cost themselves on condition that the property owners assign their ownership to the company, the part so assumed covering the estimated salvage value of the installation if it is abandoned. The property owners would lose nothing by so assigning their interest in the installation, because in case of discontinuance of service it would have no other value than that which the electric company had assumed.

Under such an arrangement the monthly charges for service that the electric company would make would differ from those for similar units in the usual overhead service only to the extent of the addition of fixed charges on the assumed salvage value of

the special equipment and the deduction of fixed charges on that part of the standard overhead installation which would be omitted. When such a white-way system is installed other street lighting is unnecessary, and the city might from the beginning assume a part of the operating cost covering such units as are needed for all-night lighting. When the character of the streets so lighted justified the assumption of the entire burden in the public interest, it should be taken over.

METER TESTING

An interesting problem connected with the commercial operations of utilities is the testing of customers' meters. This problem would not here be referred to but for the fact that its solution has not ordinarily been worked out by proper application of the economic principles involved. For this reason a solution of the question of frequency of tests, which the author has devised, is here presented. Methods of test and testing standards are engineering problems that do not need present attention.

The high, sustained accuracy which has been developed in the conventional watt-hour meter and gas meter is noteworthy, especially in view of the moderate costs of these devices. An interesting test of the ruggedness of such meters was recently made by an electric company. Meters of several different makes were placed on the floor of a truck and subjected for more than a week to the disturbances of continuous travel over all kinds of streets. The errors developed by this rough treatment were within 2 per cent, except for a meter which fell out on a hard pavement, and in this extreme case the resulting error was only 5 per cent. The tendency of most of these meters is to slow down in service and thus show insufficient registration, but the percentage of accumulated error is ordinarily within 2 or 3 per cent in a limited period of years.

Many electric companies have established the practice of testing their meters at intervals not exceeding two or three years for small meters, and six months or one year for large meters. This is in partial recognition of the fact that the amount of money involved in low registration varies with the size of the meter. Assuming that meters of suitable size are always installed, there is, nevertheless, a wide range of customer's load factor and a wide range of rates to be taken into consideration, together with

the cost of the test, in order to arrive at an accurate determination of test frequency.

The rule should be that the permissible revenue loss between tests should be approximately equal to the cost of the test. For present purposes it may be assumed that the error in meter registration accumulates uniformly. This is not strictly true, in that the error tends to accumulate more rapidly with passage of time.

A formula may now be developed in which the frequency of tests in years (which is to be determined) is expressed by X; the annual kilowatt-hours to be registered by K; the annual rate of slowing down of the meter, determined by accumulated records of meter tests, by S; the energy rate by R; and the cost of the test by C. Care should be taken in selecting R as the rate specifically applicable to the lost kilowatt-hours and not an average or other rate. The total kilowatt-hours to be registered in the interval between tests is KX, and the average error of the meter is $\frac{XS}{2}$. The error in registration is the product of these factors, or $\frac{KSX^2}{2}$ kilowatt-hours. The lost revenue is found by multiplying these kilowatt-hours by the rate applicable thereto, giving $\frac{RKSX^2}{2}$ to be equated to C, the cost of the test. Solving this equation for X,

$$X = \sqrt{\frac{2C}{KSR}}.$$

In the solution of this equation for varying conditions under which the cost of tests will run from 50 cents upward, depending upon the size and location of the meter, it will be found that the frequency of tests for the smallest sizes of modern meters is not far from four years; for power meters of fairly large capacity, about six months; and for meters on very large installations, at considerably shorter intervals, possibly every month or two. This assumes that S is a small fraction of 1 per cent. By consistently following such a rule, utilities will secure maximum income, together with the satisfaction to themselves and their customers of sustained meter accuracy and reduced unaccounted-for energy.

Gas Meters.—Gas meters do not have characteristics similar to those of electric meters, for which the above formula was devel-

oped. There are tendencies to overregistration as well as underregistration, which, for the business as a whole, tend to offset each other. Attention is needed, however, to individual meters to correct their errors, which are ordinarily so small for domestic meters that a longer interval between tests is permissible than with electric meters. A study of the history of nearly 7,000 meters located in New England indicates that a seven-year interval between inspections is suitable for small meters.[1]

AMORTIZATION

Several aspects of the subject of amortization have been discussed in preceding chapters. Electric railways in many comparatively small cities are now confronted with the problem of bus service to replace rail transportation but, with the meager retirement reserves which they have been able to maintain during recent unprofitable years, are unable to amortize their investment in rail facilities. Other classes of utilities have no such present problem, but there is no assurance that radical changes in the art may not develop such problems even if on a smaller scale.

Opinions have been expressed that utilities should look ahead to the possibilities of abandoning substantial parts of their property, creating adequate reserves therefor, and even utilizing such reserves to write down their fixed capital and correspondingly to retire outstanding obligations. If the financial condition of electric railways had permitted such procedure in the past within existing fare limitations, they would now be freer to proceed with abandonment of unprofitable rail lines and substitution of bus service.

It has been pointed out in a preceding chapter that amortization of investment involves greater current costs than the carrying of full investment, and the question has been raised as to the willingness of present patrons to assume additional burdens for the benefit of future patrons. Amortization involves other difficulties which are not always foreseen. If, after a period of years, a certain utility has amortized a substantial part of its investment and had its rates reduced in proportion to its diminished fixed charges, it might be confronted with possibilities of a large volume of new business. If such new business required

[1] VITTINGHOFF, H., "Periodical Inspection of Consumers' Gas Meters," *Stone & Webster Jour.*, March, 1922.

complete new investment, existing rates would not be sufficient to cover the full cost of the available business and the utility would face the alternative of taking the business at a loss or declining to extend its service because of inadequate rates. A preceding chapter has urged the accumulation of liberal reserves for retirement purposes during periods of prosperity and under rates that are reasonable as compared with those existing elsewhere under similar conditions and as compared with the value of the service to its users. Such accumulation should be urged in spite of opposition which may develop in rate cases or criticism of the size of existing reserves such as have appeared in recent telephone rate cases.

The problem above referred to of disposing of abandoned railway property has not been solved. Where bus service can be substituted at a total cost, including carrying charges on the equipment, less than the cost of operating the alternative rail service, the customers of the railway might have the advantage of more satisfactory bus service without any increase in cost. They should, therefore, not object to a continuance for the time being of carrying charges on the abandoned railway facilities, but the investment in these facilities should, of course, be amortized at the earliest possible opportunity. The whole problem of such amortization and the reserves necessary to that end involves a fine balancing of the respective rights and obligations of both the utilities and their patrons, and no general rule of procedure can be stated other than that provision for future contingencies should be as liberal as the existing business can reasonably support.

SUPERPOWER

There has been much discussion in recent years of so-called "superpower" and also much misconception of the real meaning which should attach to this term. Some people have professed to see in superpower an effort on the part of large utilities to monopolize power resources through the interconnection of existing large systems, particularly those utilizing water power on a large scale, and to extort undue profits from public service customers. Others see in superpower an effort to conserve fuel resources by utilizing economically available water power to its maximum extent through association with supplementary steam plants, and to secure further economy for the benefit of customers

through the wide interconnection of power supply systems. The most efficient plants or units would then generate the bulk of the power, leaving the least efficient units, wherever located, to carry loads only at peak periods or in case of breakdown.

A further decided advantage in such interconnection lies in the reduction in spare capacity necessary for relay purposes. Each isolated power system must maintain reserve capacity in order to furnish full service in case of any breakdown. If a number of such systems are interconnected, it will not be necessary for each part to maintain a relay unit, because breakdowns or withdrawals from service for periodical inspection and repairs will not occur simultaneously at all stations, and they might be restricted to one station, or at most a comparatively small number of stations, at a time. This saving in relay capacity represents a substantial proportion of the existing investment in generating facilities and hundreds of millions of dollars in money.

The most efficient large stations are now generating electric power with a fuel consumption of 1¼ pounds per kilowatt-hour, or better, and many of them are located at tidewater where the delivered cost of fuel is comparatively low. The least efficient stations in regular operation have a fuel consumption more than twice that above stated. Many of them are located inland where the cost of coal delivery is large, and coal prices are also higher because of the small quantities purchased. The saving in fuel by interconnection of such systems and in other costs of production is, therefore, very large, justifying the building of long stretches of high-voltage transmission lines. Transmission voltages in excess of 200,000 are now in extended use, permitting the transmission of large quantities of power over small conductors for distances of more than 200 miles.

As an engineering problem it is not difficult to determine the extent of transmission investment justified for interconnecting certain systems to bring about saving in power facilities or production costs, or both. Transmission line costs vary from $2,000 per mile for a short low-voltage, single-circuit line, to five or ten times that amount for heavy, steel-tower lines over long distances with voltages of 100,000 or more. Substation equipment, including transformers, lighting arresters, switches, etc., are not included in these figures. As a practical matter, interconnections have been and are being constructed under circumstances where engineering computations have shown no specific advan-

tages, but unforeseen advantages have usually developed through diversity in power demand from varying industrial requirements, or differences in longitude, or marked differences in run-off which frequently develop in the separate watersheds of interconnected hydroelectric systems.

At the present time interconnections cover the entire Pacific Coast area of the United States, with the exception of one break of a few miles in Washington, and run inland nearly 1,000 miles in the northern section. A very large part of the territory east of the Mississippi River is similarly covered, including practically continuous lines from Boston to Chicago, Lake Erie to Chesapeake Bay and Virginia to the Gulf of Mexico. It calls for little imagination to foresee within a comparatively few years a possible interchange of power between practically all important centers throughout the entire eastern half of the United States. The financing and administering of this vast power interchange system in the interests of all participants, and the drafting of equitable working agreements, are largely problems of the future.

Unfortunately, some of the dreams of the uninformed advocates of superpower cannot be realized. They have foreseen the erection of enormous power plants adjacent to coal mines where the cost of transporting coal would be avoided and where, in many cases, unmarketable accumulations of low-grade fuel could be utilized at negligible cost. Steam generation on a large scale requires condensing water in surprising quantities—from 20,000 to 30,000 cubic feet of water for every ton of coal burned. Such quantities are available at or near the mouth of very few coal mines, and so coal must be transported to localities where ample condensing water and the power market are not too widely separated. Even if electric power could be generated at the mines, the distances over which it could be successfully transmitted in large quantities in competition with the alternative transportation of coal are limited.

Furthermore, the interconnecting of small, widely separated systems is not justified because the saving in reserve capacity and in operating cost would be less than the carrying charges on the transmission investment. Substantial amounts of power transmission or interchange are necessary, and the usefulness of a particular transmission network may be limited by the capacity of its smallest link.

Regulation of Superpower.—The regulation by state or national authorities of superpower systems is another problem which has not been solved but which will need future attention. The fears above expressed of a dominating monopoly are not in any large measure consistent with powers of regulation already existing. In particular, state commissions can prescribe reasonable limits to the cost of electric power generated or purchased, which utilities under their supervision may include in operating expense in the determination of equitable rates. The opportunities for oppression through interstate commerce in electric power are, therefore, restricted even if the disposition for such oppression existed.

Where hydroelectric systems on public domain or navigable waters are involved, adequate regulatory machinery exists in the Federal Power Commission, and such machinery can be expanded if or when occasion for further regulation arises. In an address to the National Electric Light Association on May 21, 1924, Secretary of Commerce Herbert Hoover said of superpower: "It implies no gigantic exploitation, for that is impossible under state regulation of rates and profits." It is estimated that 85 per cent of the available water power of the United States comes under the jurisdiction of the Federal Power Commission.

Licenses issued by the Federal Power Commission for hydro projects, completed or now under construction, and involving about 600,000 horsepower, show an estimated average cost of $370 per horsepower or $490 per kilowatt. Up to the end of 1924 the Commission had issued final licenses covering nearly 3,000,000 horsepower and preliminary permits for more than 5,500,000 additional horsepower. The Commission has received, since its organization in 1920, applications covering more than 39,000,000 horsepower of ultimate developed capacity, an amount more than four times the total existing water-power developments in the United States.

Limitations.—There is much popular misconception regarding the savings from hydroelectric power. Saving in cost of production exists, with possibilities running up towards 40,000,000 tons of coal per annum or its equivalent if all the 55,000,000 horsepower (available 50 per cent of the time),[1] in the United States were developed and could be used, in addition to substan-

[1] Annual Report of Federal Power Commission, 1924.

tial saving in man power, maintenance, and other incidental costs. Hydroelectric developments are, however, expensive, as compared with steam plants and, as a rule, they are remote from power-using centers, necessitating long and expensive transmission lines with their attendant carrying charges and upkeep costs.[1]

Few hydroelectric developments are assured of anything like a uniform flow of water, involving a curtailment of the installed capacity within the limits of sustained flow or steam-power development to relay the intermittent flow. Such relay plants and the cost of long transmission lines commonly take away much of the advantages of hydroelectric power over steam, leaving only a fraction of a cent per kilowatt-hour to represent the reduction which can be made in the rates charged to users of service. This is a very small proportion of the total cost of rendering retail service, the major part of which is made up of carrying charges, taxes, expenses connected with distribution, servicing, metering, accounting, and administration, and other items which are far more prominent in retail service than in large power. The advantages of hydroelectric service are, therefore, largely restricted to wholesale users of power.

The construction of any large hydroelectric plant, unless in an unusually favorable location, involves a refined balancing in engineering computations of advantages against disadvantages and costs against savings, this balance showing a comparatively small margin in either direction. If every possible available horsepower in the streams of the United States were developed and utilized, there would still be a substantial margin of demand for supplementary steam power, and this demand will steadily increase with expansion in industrial life. Hydroelectric power should, therefore, be looked upon as a means of conserving natural resources rather than of reducing the cost of utility service to the average user. Interconnection will assist not only in the distribution of available hydro power but also in increasing the efficiency of use and further conservation of fuel supplies.

[1] PENROSE, CHAS., "Further Studies of Giant Power," *N.E.L.A. Bull.* p. 367, June, 1925.

CHAPTER XVII

VIEWS ON OUTSTANDING ISSUES

The foregoing chapters have embodied an unanticipated volume of material and discussion, a considerable part of which is of interest primarily to specialists in certain lines and, therefore, may distract the attention of the average reader from the more important general features. The primary thought throughout the book has been to assemble the essential facts regarding the development and present status of public utilities and authoritative views on important existing questions. The author has refrained from emphasizing his own views on such questions, although his contact with the industry, covering more than 90 per cent of its development, has involved a continuous study of its major problems and the formulating of opinions which may be worthy of further expression. For these reasons this concluding chapter will briefly summarize what the author believes to be the outstanding present problems of the industry, with such additional observations regarding them as their importance warrants.

FRANCHISES

Public utilities are essentially continuing industries. It is not conceivable that modern complex life could go on without their service. Other industries may be indispensable, but they do not require direct, intimate contact with their customers, and the location and continued existence of particular projects are, therefore, not vital, as is the case with public utilities. Because of the essential permanence of public utilities, their progress should not be recurrently disturbed by political agitations and wrangling over renewals of term franchises. Under regulation the modern franchise should have its life limited only by failure of the grantee to meet its obligations or by purchase of the property by the community served. States which now lack legislation necessary to the granting of terminable franchises should speedily provide it. The permanent character of public

utilities is further recognized in modern forms of capitalization, such as open-end mortgages without restrictive life, under which bonds may be recurrently issued and reissued, and similar serial types of junior securities, under all of which new financing may be undertaken without reorganization or other complications and expense.

RETIREMENT ACCOUNTING

It may not be appreciated that an accounting detail may vitally affect the future of the utility industry, yet the author so views the existing controversy regarding depreciation accounting. Certain prescribed systems require uniform accruals through expense to a depreciation reserve based upon estimated useful life of depreciable property, such accruals to be made regardless of business conditions. Other prescribed systems require the accumulation of a retirement reserve intended primarily to equalize retirement costs, this reserve to be accumulated by charges to expense or appropriations from surplus, or both, at rates which are not necessarily fixed but which recognize the degree of current profitableness of the business.

Aside from an accumulation under the first-named method of reserves greatly in excess of actual retirement requirements, with necessarily higher rates to permit such accumulation, its inflexibility has a disturbing effect upon utility credit. The author has carefully studied this question in the light of the history of a large number of properties covering a long period of years, and is assured that the application of a system of unvarying provisions for depreciation would have been disastrous to many of them, and would have prevented their successful functioning and development. The alternative flexible system of appropriations which has been in effect upon these properties has in no case been responsible for inadequate or unreliable service, or otherwise operated to the disadvantage of either patrons or investors. This system requires conscientious and broadminded administration, but no more than should be accorded to any important problems of complex enterprises. It is, therefore, emphatically urged that the use of inflexible systems of reserves for property upkeep, based upon estimates of useful life, be restricted as far as possible, but with the clear understanding that the flexible alternative must have an equally definite goal which must be approached with equal fidelity.

REGULATION

Competition.—The history of regulation of public utilities, which has developed largely during the last twenty years, shows results generally satisfactory to customers, investors, and utilities. Certain existing methods of regulation, however, need modification. Some commissions still lack the right to prevent competition between like utilities. It is important that all commissions should have such rights in the interests of both customers and utilities. This problem of competition is no longer acute in the field of electric and gas service, but there is pressing need of coordination of urban transportation, rail and railless, to bring about most efficient service at reasonable cost. Regulation should be state-wide rather than local for maximum freedom from local prejudice and political influence.

Incentive.—Another phase of regulatory policy, in which further legislation is not involved, should be mentioned. The usual practice of regulatory commissions in rate cases of establishing a fixed rate of return tends to discourage progressiveness and efficiency of operation. If the advantages of improved or more efficient service are systematically taken from the owners of utility properties and given wholly to customers through rate reductions, leaving only a fixed return upon the value of the property, there is no incentive to extend or improve the service. The need of such an incentive to prevent stagnation in the industry has been recognized by certain commissions through flexibility in the rate of return. Such procedure should be encouraged and broadened in the interests of better service.

Return.—The return which public utilities are authorized to earn in rate proceedings before the commissions has not always been clearly understood. Commissions cannot fix the return which investors require for the use of their money but can only interpret this return in the light of money-market conditions. If their interpretation is in error, it may mean that the utilities will be unable to obtain funds necessary for their expansion in competition with other industries not similarly restricted. Even if money can be secured for pressing needs, it may involve an unbalancing of the financial structure of the utility, leading ultimately to impaired credit and higher average cost of money.

Too much attention has been given to limitations upon the distributable income of utilities. The difference between a liberal return which will encourage investment for development

of property and service, and a meager return which will not permit free expansion in keeping with community growth, is in reality an insignificant amount so far as retail service is concerned, being less than 1 cent per day per individual customer. Americans are not stingy. They spend more money for wholly dispensable luxuries than they do for all classes of public utility service combined. It is inconceivable that the average patron of a public utility would prefer inadequate and unreliable service rather than good service, at an added cost of only a few per cent of his extravagances in other directions. The whole problem of return is to fix a rate just high enough freely to attract capital to the business, but, where exactness is not possible, as is usually the case, the common interests of customers and investors are in the direction of liberality.

VALUATION

Basis.—The lengthy discussion of valuation in a preceding chapter involved many technical details. The outstanding question, however, is as to whether the cost of reproduction or the investment shall predominate in fixing the rate base. The higher courts have consistently shown preference for the reproduction method as the basis of present value, although forceful dissenting opinions have been filed. Some of the regulatory commissions, on the other hand, have consistently adhered to investment as the most stable, satisfactory, and simple basis of value. The consistent aim of public utility executives, as well as regulatory authorities, has been to remove public utilities from the class of speculative enterprises and to give them such stability as will attract investment funds from all sources, including the most conservative. Common stocks of public utilities cannot have stability under widely fluctuating costs of construction if the rate base is to be recurrently determined from present cost of reproduction.

It is, therefore, urged that utilities in future rate cases rely primarily upon investment so far as this can be done without jeopardizing legal rights in connection with possible appeal to the courts. The only reservations attaching to this recommendation apply to abnormal conditions under which a rate of return as high as the commissions may feel free to fix does not, when applied to investment, yield an income attractive to investors. It is to be hoped that the future will see a recognition on the

part of the courts of the unique character of public utility property, and that some method, such as has been proposed herein, may be developed which will tend to harmonize the present discordant views on valuation.

Accrued Depreciation.—Attention is called to the increasing departure in court and commission decisions from the practice established in the early years of regulation of making deductions from appraised value on account of accrued depreciation. In recent years decisions have clearly indicated that useful life is not a reliable basis for such deductions, and that even observed depreciation cannot be deducted without qualification. Many decisions, largely of commissions, make deductions only to the extent of reserves actually earned for depreciation. Other decisions will be found in increasing numbers in which no deductions whatever for depreciation are made from the appraised value, and it has been shown that such procedure involves no injustice to any interested parties. It is urged that this practice be generally adopted to avoid the menaces and uncertainties involved in depreciation deductions now existing in the minds of investors and executives, and affecting the stability of public utility investments.

Going Value.—In establishing a rate base going value should not be overlooked. Costs of developing business and other losses in early years are inevitable with a normal utility. If such items are ignored in future years in fixing a rate base and there remains no way in which the early losses can be recovered, the investment of money in new utility projects will be discouraged, and investors in existing projects will hesitate about extending their interest in a field subject to restrictions which are not encountered elsewhere.

PAVING

The matter of paving charges against electric railways has been referred to or discussed in several preceding chapters because it is the outstanding anachronism of the industry. The only excuse for the survival of this ancient practice is that it is provided for in statutes or franchises. The objections to it are so pronounced as to excite wonder that it is permitted to survive in the case any regulated railway. Paving charges are a burden upon working people and others who use street cars, for the benefit of those who own pleasure or commercial vehicles or have homes

on the paved streets. The injustice is enhanced by the concentration of automobile traffic upon the pavement which the car rider is paying for but does not use, slowing down car service, adding to its accident liability, and otherwise increasing its cost—all at the car rider's expense.

Possibly, some of the hesitation over the abandonment of this obsolete practice arises from a doubt whether under certain existing conditions the car riders actually do pay for paving along car tracks. Perhaps the railway in some particular city is so unfortunate that it cannot charge a fare high enough to cover the full cost of service, including paving charges. If, under such circumstances, it is really the stockholder and not the car rider who pays, why hasten to transfer the burden to taxpayers? That is a pertinent question, but its answer is not as obvious as may appear. Any public utility earning an inadequate return through no fault of its own naturally seeks to increase that return in every practicable way. It will give only a minimum of reasonable service, it may neglect the upkeep of its property, and it will necessarily forego those extensions and improvements of its system which community growth calls for, and which more liberal income would permit. The car rider does not escape. The burden which his more prosperous neighbor imposes upon him is merely changed from an excessive fare to inadequate and unreliable service.

SPECIAL TAXES

Paving charges are not the only exactions to which utility patrons are subject. They include franchise and other special taxes which have no present justification. In all such cases the utilities are assigned the disagreeable task of acting for the cities as collectors of taxes which the cities themselves would not openly impose upon those who finally pay them. Such inconsistencies and discriminations should speedily be corrected.

CUSTOMER OWNERSHIP

The most striking recent development in the industry is the customer-ownership movement. The thought that utility customers may own the equivalent of the facilities required to serve them has an increasing appeal. It is believed that therein lies real public ownership rather than in the more conventional form

through which municipalities build plants that in reality are financed by "Wall Street" or other far-away creditors. Some municipal plants charge sufficient rates to pay off their indebtedness, but it is done only through higher rates than would be necessary if all customers paid indefinitely only the current cost of service, including full provision for property up-keep. The increased cost of all borrowed money when municipalities go outside the administrative field and into business ventures should not be overlooked. Regulation, together with customer ownership, has removed all known logical reasons for government ownership in the utility field.

PUBLIC RELATIONS

Customer ownership has also been very helpful in the establishment of better public relations between utilities and their patrons. The need of improvement in this respect has been clearly recognized in recent years to offset the misunderstandings of earlier years. The growing appreciation of the mutality of interests between utilities and the communities which they serve is a gratifying result of the standards which the companies have set up, and affords encouragement to more conscientious efforts in the future.

THE OUTLOOK

The future holds abundant promise for continued growth and usefulness in the public service field. A number of observers of utility development have expressed apprehension regarding the future of the railway branch of the industry. Such apprehension has been based upon the greatly increased cost of railway service and the phenomenal growth in competition from automobiles, private and commercial. In spite of these unprecedented conditions, it appears that the lag in readjustment of revenues to post-wartime increases in cost has already been measurably overcome, and that throughout the entire period of increasing automobile competition the per capita traffic of the industry as a whole has shown a steady increase. Many small independent railways have not shared in this increase and they are faced with the problem of substitution of buses or a combination of rail and railless transportation. Experience with automobiles and buses has conclusively demonstrated that such service cannot handle mass transportation in the larger cities,

and the responsibility logically rests upon the railways of developing and maintaining such forms of transportation as are adapted to varying public needs, and of securing adequate revenues from this service.

Other branches of the public utility industry have no similar disturbing problems. The growth of the industry, for which they are largely responsible, as measured by increased investment, is now at a rate in excess of $1,500,000,000 per annum. This is approximately double the current increase in railroad investment, and the record of a considerable period of years shows an unbroken substantial excess over such investment. If, as is to be expected, the present rate of growth continues, the public utility industry within a few years should take the lead over railroads in total investment, and thereafter maintain supremacy over all other groups of allied industries in investment in created facilities.

The outlook for electric light and power companies is particularly promising, with 5,000,000 accessible unwired homes, prospects of widespread domestic refrigeration yielding revenues per unit of investment greater than any other comparable business, over 6,000,000 farms without electric service, and two-thirds of all industrial power requirements still independently supplied. Without further corroborative data, which are abundantly available, it is clear that this industry has unparalleled opportunities for greater usefulness and expansion of service.

SUBJECT INDEX

INDEX OF CASES CITED

Note.—Cases are listed under the names of the utilities involved unless another designation is commonly used.